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August 15, 1946

Number 4

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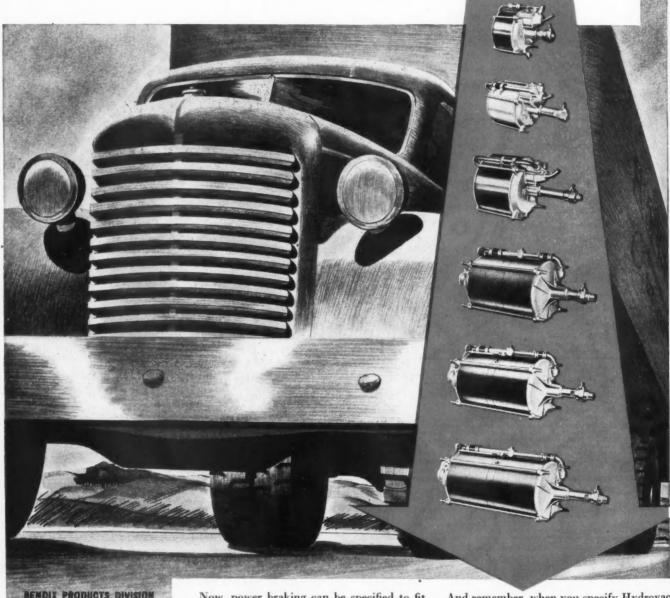
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August 15, 1946 Volume 95, No. 4

Profit Sharing vs Production Incentives

By Albert Ramond

President, Albert Ramond Associates, Inc.

MOME industrialists and business advisers have professed to see in the profit sharing idea a solution to many management-labor conflicts, at the same time maintaining the desired labor interest and cooperation in all matters that affect costs and profits.

There is no question that profit sharing has sometimes been effective in promoting active interest of the employees in company affairs, greater cooperation and better labor relations. However, this is true only where a relatively small number of workers is concerned. In the larger organizations the results have seldom been favorable. The difficulties arose when profits dropped while production increased. The workers felt that their contribution was as good or better than previously and could not understand why they should be "penalized" because of reduced profits.

A recent study covering 613 companies known to have had experience with profit sharing, led to the conclusion that "The preponderance of evidence is that profit sharing has made no substantial contribution to the improvement of employer-employee relations," and that "there is no considerable body of evidence that it has any more effect in inciting wage earners to greater effort than would a lottery ticket."

The main objection to profit sharing is that the workers' share is generally predicated upon results over which they have only limited influence. Management policies and practices on sales and distribution, engineering developments, purchases, finances and other factors, may control as much as 95% of the profits or losses of a company. Unless management is ready to accept labor participation in ALL phases of management, there is a great risk of labor criticism, dissatisfaction and interference as soon as profits do not correspond with labor's appreciation of its own performance. This situation is aggravated in the larger organizations when the workers cannot readily understand other management problems and conditions influencing the business. In smaller organizations profit sharing, competently handled, may become a good influence toward securing the workers' active cooperation and interest, including promotion and application of technological advances.

Production incentives generally provide a closer relationship between labor contribution and reward, but the usual forms of production incentives, however effective in promoting greater labor utilization and reducing production costs, do not necessarily promote the most favorable atmosphere for the reception and utilization of technological advances. Some forms of production incentives may even actually conflict with this objective. Most technological advances result in lesser manpower requirements, and therefore lead to smaller time allowances or lower piece prices. Even if these are such that the workers can maintain the

(Turn to page 96, please)



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RYERSON STEEL

Reuther Conference Dud

Brings Out More Data on Low Production

THAT was behind the move by the UAW-CIO to call an industry-wide conference early this month to discuss the reasons for low production in the automotive industry? The consensus among labor observers in Detroit is that there were several plausible reasons, namely: To get the union off the hook with the public; to use the conference as an entering wedge to the union's long range objective of industry-wide participation in management; to drag a red herring across the trail of higher prices which stem directly from the ill-starred strikes that forced higher wages with

no increase in production; to put the onus on industry when it is well known that strikes in supplier plants are a principal cause of low production; to get Walter Reuther, union head, back into the headlines; and to divert public attention from the union's fight against increased worker output and incentive pay plans.

In his invitation to the automobile companies. Reuther contended that the "few" strikes current in parts and supplier plants could not possibly account for the present low levels of production, which indicates that the union has been stung by the factual reports put out by General Motors, Ford, and other companies listing the number of strike-bound suppliers currently affecting car assembly operations. The industry has done a good public relations job in getting such facts before the public and undoubtedly Reuther was at least to some degree forced to take public recognition of the issue. When only three of the companies - Kaiser-Frazer, Studebaker, and Willys-accepted the invitation, he reacted in characteristic fashion by formally requesting that the Mead Committee investigate the automotive industry for hoarding, stockpiling, and hidden inventories.

As the industry had correctly predicted, little of value came out of the conference. Reuther made a determined effort to show that the basic cause of low volume production is the result of scarcity of basic materials, brought about by dislocations, withholding from the market in hopes of higher prices, and short-

Makers Show Strikes and Slowdowns Chiefly Responsible for Failure to Maintain Schedules

By Leonard Westrate

age of scrap for making steel. He did not in any case, however, relate the shortages to the strikes in steel, coal, copper, and other industries. He also charged the Big Three with having an understanding which reflects monopoly controls over basic economics in the industry. When he said that the industry should use its influence to force better labor relations on vendors, industry representatives took strong exception to the statement, saying that such tactics would be highly improper. They also gave detailed explanations of the troubles they are experiencing with strike-bound suppliers, but all in all the meeting wound up on a very inconclusive note.

The whole affair served mainly to highlight the deep-seated differences and distrust which exist between management and labor today in the automobile industry, especially where Walter Reuther is concerned. On the basis of past history, the industry knows Reuther for a shrewd and calculating labor leader, and the refusals were couched in polite and diplomatic terms. The cleavage is a wide one.

In rejecting the invitation, the six automotive companies took great pains to outline their positions. In essence, their premise was the current and past strikes among parts suppliers and in basic industries are responsible for low production and that little of value could be achieved by a conference of manufacturers, since the settlement of such stoppages is in the hands of the unions and the struck companies. Most, how-

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RIES

ever, said they would be glad to attend individual conferences. Following are highlights of the letters sent by presidents of the various companies to Reuther:

Statement of Henry Ford II

"I cannot agree that the conference to which you invite me provides hope of any solution. My reasons are simple. First-your letter implies that it is only current strikes which impede automobile production. That is, of course, far from the truth. As examples, I need only remind you of the coal and steel strikes and the more serious parts company strikes of the past 10 months, the effects of which we will continue to feel for many months to come. Second-you imply that your get-together of a few automobile manufacturers will somehow provide answers to many basic questions. In reality, at the present the answers lie in the plants of the parts makers and of other industries all over the country which supply us with materials. Your invitation, no matter how well intended, is misleading because it leaves the impression that you are not acquainted with these simple facts.

"I have a suggestion to make, however, and that is that the UAW-CIO do something about the current strikes in 16 plants supplying our company. The employees of these plants are represented by the UAW-CIO. At this moment any or all of these strikes threaten to close us down at Ford. You and your Union could make a genuine contribution to automotive production by bringing about the resumption of work in these plants."

Chrysler Schedules Disrupted

"It is not only existing strikes which now affect our output materially. Long continued strikes of the past in the steel, coal, copper and other industries, caused great shortages of basic materials which still hold us back and hold our suppliers back and probably will for months to come. The aggregate, cumulative effect of these strikes on our output is tremendous. They account for no small part of the difficulty in attaining full production.

"The problems all are individual and a town meeting can not resolve them. So far as the strikes are concerned, presumably they are due to issues of one kind or another between the suppliers and the UAW or other unions. Chrysler Corporation can do nothing about these strikes outside its plants except to seek other sources of supply. The labor relations of our suppliers is a field into which we have never injected ourselves, nor attempted to exercise any influence. We would consider it improper and ill advised for us to attempt it.

"Our records show that we have suffered from 142 strikes in plants of our outside suppliers, 17 of which are still going on. Since V-J Day we have also had 39 strikes in our own plants involving 79,641 employes and 290,078½ hours lost. In August there were two; in September, five; in October, November and December one each; in January and February, none; in March, two; in April, three; in May, one; in June, eight, and in July, 15. None of these was an 'author-

ized' strike. All were in violation of your Union's contract with Chrysler. All could have been avoided if the men involved had resorted to the bargaining procedure under that contract with the Union.

"The result is that from October 1945 to the end of June 1946 instead of producing 846,495 vehicles which we had scheduled for those nine months, we actually produced 317,560—a loss of 528,935 vehicles. Our revised schedules for the third quarter of this year call for 384,000, but due to existing conditions and the lasting effects of earlier strikes, we know we cannot attain that output by about one-third. In other words, the public will be short at the end of the third quarter about 688,185 vehicles which we had schedules to produce but will be unable to produce because of shortages of materials.

"If the UAW is really interested in helping to achieve full schedules, to the extent that material shortages due to strikes by UAW unions are impeding it, we suggest in all friendliness and understanding of the UAW's concern about the problem that the UAW should get busy on the strikes that are currently affecting the flow of materials to automobile assembly lines. To make up for shortages caused by earlier strikes, which is also imperative, the UAW could do a great deal now by encouraging its members to full attendance and full output at their work."

General Motors Reply

"We are surprised that your committee has come to realize only at this late date the effect of long and widespread strikes on the production of automobiles. In General Motors alone the production lost, exceeding 1,000,000 passenger cars and the wages lost, exceeding \$200,000,000 can never be regained.

"Specifically, production has been forced to present low levels because of: 1. The long General Motors strike which closed all of our plants for nearly four months, and some of them for almost six months. 2. Refusal of your union to permit men employed by outside contractors to work on reconversion and new construction during the strike. Your union even went so far as to attempt to stop all of our die work and tooling in outside shops. 3. Strikes in the steel, coal, glass, electrical and railroad industries, the effects of which are still being seriously felt. 4. Strikes in the plants of important suppliers of parts after major strikes in the country had been settled. Large and small, as of July 29, there have been a total of 617 strikes in the United States that have affected our suppliers and our production. Of the strikes still going on, 20 are by UAW-CIO unions and 27 are by other CIO unions.

"Since most of the damage has already been done and the remaining strike problems of some suppliers affect the production of individual car manufacturers and not the production of the industry as a whole, and especially since the settlement of these strikes are matters to be worked out between your union and these parts companies, nothing could be accomplished by a meeting.

"We hope that a review of these large and national strikes and their affect on production, prices and employment by your committee and other union leaders will result in more responsible union leadership and avoid subjecting our nation to another wave of strikes similar to those we are just getting over."

Packard's Shortages

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STRIES

"Since building our first cars in October of 1945, there has never been a time when our own facilities to produce have limited our production. The limitation has always been the supply of materials and units.

"Originally, plans were made to produce 179,800 cars from the start of production in October of 1945, through the complete year of 1946. Due to circumstances beyond our control, it has been necessary to revise this schedule downward at eleven different times between October, 1945, and May 28, 1946, from the original schedule of 179,800 cars to a total of 71,388. This latest is an optimistic schedule, as under present conditions it cannot be accomplished.

"Build-up of volume in our production cannot be accomplished without a previous build-up in materials and units for production of complete car assembly. Under present conditions this build-up cannot be made. We are not able to obtain the necessary materials and units to keep our lines running regularly, even on our present reduced schedules.

G M Suppliers' Strikes

 "The materials limiting us for the rest of the year are:

Steel Cotton goods
Pig iron Lead
Terneplate Scrap iron
Copper Leather

"The strikes in the steel and coal industry have caused, and will continue to cause, limited production during the remainder of the year 1946.

"The strikes we are experiencing today, whether 'wildcat' or authorized by the UAW-CIO, will not necessarily alter total volume for the remaining period of 1946. They make expensive the limited production that can be accomplished, and prevent the planning for even any moderate increase in schedules by preventing any accumulation of stock for that purpose."

Nash Statement

"In your letter you say that the 'UAW-CIO has just completed a survey of the current strikes in our industry,' and that you are 'at a loss to explain how the existing strikes could seriously retard the achievement of high production schedules.' This survey on your part apparently fails to take into account material shortages directly resulting from the numerous and prolonged strikes which took place in the coal, steel, electrical and automotive fields, just to mention a few. The effect of these strikes in terms of raw and finished materials is really the major factor in the 'low level of production' of which you speak and it is taking many months to overcome this condition. In addition, the continuation of absenteeism and unrest in many plants is a serious barrier to full production.

"We believe the UAW-CIO could do much to improve the present low efficiency and low production in many of the plants of our suppliers. Their past and present inability to produce the quantity of materials and parts which their plants are fully equipped to handle is a serious loss to us.

"The relationship between practically all of our suppliers and ourselves has been one of many years' standing and we would not discuss their problems in open meeting or in the presence of competitors. Obviously, this would be quite unfair. At the same time, we would review these problems with you privately and confidentially with the thought of securing any assistance you might be able to give our suppliers and ourselves."

Studebaker Letter

Although Studebaker accepted the invitation, it did so with reservations. In a letter to Reuther, Paul G. Hoffman, said: "I should like to give you our over-all production picture for the past nine months. From Oct. 1, 1945, when we were scheduled to resume production of passenger cars, to June 30, 1946, Studebaker produced approximately 43,000 passenger cars and trucks as against a scheduled production for the period of 134,500 units. Our failure to attain scheduled production was due almost entirely to strikes and slow-downs in plants of suppliers. This failure cost



THE manifold applications of rocket propulsion to warfare during World War II (Bazooka, aircraft rockets, anti-aircraft rockets, LSM landing craft rockets, Nazi V-2, etc.), as ubiquitous and deadly as they proved, now appear only harbingers of future warfare which may well take the form of total rocket operations, at least in the early stages. That the various Services are convinced of its future importance is measured by the intensive and widespread scope of research and development work on rocket propulsion and its application to guided missiles now well under way.

Within the War Department, guided missile programs are being sponsored by the Army

Air Forces, Army Ground Forces and the Army Ordnance Department, all coordinated by the Research and Development Division of the Army General Staff. Within the Navy Department,

similar programs are being pressed by the Bureau of Aeronautics, Bureau of Ordnance and Bureau of Ships. Directing these combined efforts is the newly-created Joint Research and Development Board, an agency of the Joint Chiefs of Staff, headed by Dr. Vannevar Bush. Hundreds of universities, industrial laboratories, manufacturers and proving grounds are being utilized in this vast program, a major portion of which is directed towards the development of a family of rocket-powered guided missiles.

One of the major problems of this gigantic research effort is rocket fuel. As in the development of any propulsive fuel, high heat release is not the only objective in rocket fuel research. A rocket fuel must possess all of the following characteristics if it is to find widespread application to warfare:

(1) High heat of combustion. The thermochemical energy per pound of the fuel must be high and easily and completely released by reaction with oxygen.

(2) Fast, practically instantaneous, combustion or explosion. This is necessary for the development of high power, which varies inversely with the time required for the completion of the reaction between the fuel and oxygen.

(3) Low molecular weight. Since rocket thrust varies inversely as the square root of the molecular weight of the fuel, the latter must release the greatest possible energy for the

lowest possible mole c u lar weight.

(4) High density or low

specific volume. This is necessary because of stowage problems within the missile.

(5) Self-starting, if possible. The mere contact between the fuel and oxygen should produce combustion, thereby eliminating the need for complex starting equipment.

(6) Safe to store, transport and handle. Although few volatile substances are completely "safe," the various ingredients of the fuel should possess characteristics capable of being controlled through isolation from one another, the use of proper containers, freedom from vulnerability to atmospheric changes and stable for practical lengths of time.

(7) Fuel constituents should be widely available in time of war. The processing of raw mate-

By Robert McLarren

Engine Fuels

rials, the size and complexity of plant facilities required, the manhours of skilled and unskilled labor, etc., should be a minimum.

Rocket fuels fall into two physical classes—solid and liquid, and into two chemical classes-monofuels and bifuels, the former depending upon the surrounding air for its source of oxygen for combustion. Generally, solid fuels are being specified for shortrange rockets, such as air-to-air and surface-to-air missiles containing comparatively small explosive charges because of their lower costs. Their thrust is generated almost instantaneously (usually less than one second) and the remainder of the flight follows the familiar free-air trajectory associated with artillery shells. Liquid fuels predominate in the longrange rocket field, such as surface-to-surface and air-to-surface, due to the fact that combustion may be sustained over comparatively long periods of time. Thrust is continuous for a period of minutes or even hours and the flight of the rocket may be made to follow any prescribed path through the use of gyro or remote controls. Since liquid fuel rocket engines are more complex than solid fuel engines and, therefore, more expensive, liquid fuel rockets normally are confined to the larger sizes carrying considerable quantities of explosive.

solid fuel rockets are normally fired in the "as manufactured" condition, no adjustments or charging of the rocket is required in the field.

Solid fuel combustion is a function of the powder grain shape, the burning moving around the edges of the grains progressively through the charge. The rate of combustion, therefore, is controllable only through the use of various grain forms. Normally, long, rod-like grains of cruciform cross section are used to insure even burning speed throughout the charge. Some solid fuels are:

BALLESTITE-During the war the Army Ordnance Department used this double-base powder for aircraft rockets, notably the 4.5 in. High Velocity Aircraft Rocket (HVAR). It is made up of nitrocellulose and nitroglycerin and, obviously, is an explosive rather than a fuel. Its application to rocket power has been virtually abandoned in favor of more

promising solid fuels.

HYDRAZINE NITRATE—The potentialities of this solid fuel are being investigated by California Institute of Technology under contract to the Army Air Forces. It is extremely difficult to handle. Its combustion temperature of 620 C. presents metallurgical problems in the design of a rocket engine,

Solid Fuels

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The principal advantages of solid fuels for rocket propulsion are:

- (1) There are few, if any, unexplored combustion problems. Many centuries of study of interior ballistics of artillery shells have provided nearly complete fundamental theoretical data as well as applied research and empirical knowledge.
- (2) No air is required for combustion. Rocket solid fuels are bifuels, the oxygen required for combustion being contained within the propellant.
- (3) Storage, transportation and handling difficulties minimized. Since

S in all technical fields, a standard unit of comparison is available for accurately evaluating rocket fuels. This unit is "specific impulse" and is defined as the combination of thrust (lb) and time (sec) per pound of fuel. Although the Germans and the British used specific impulse as "lb-sec per lb," U. S. technicians write it as "secs." by permitting the "lb" units to be cancelled.

The specific impulse of a number of rocket fuels is given in the accompanying table. It will be noted that two values are given, the actual value and the theoretical value. Actual values are slightly lower due to dissociation phenomena, incomplete combustion, fluid friction, radiation of the heat, etc.

	Specific Impulse	
Rocket Fuel	Actual	Theoretical
Liquid Hydrogen and Liquid Oxygen	343	350
Liquid Oxygen and Alcohol		
German data	220	235
U. S. data		320
Liquid Oxygen and Hydrocarbons		240
Hydrazine Nitrate		240
Nitric Acid and Amine Compounds		220
Hydrogen Peroxide and Hydrazine Hydrate		
(T-Stoff and C-Stoff)	180	200
Hydrogen Peroxide (decomposition, no combustion)	120	150
Solid Fuels	120	140
Gasoline and Air (for comparison)		100
•		

POLYSULFIDES—These are rubber-base solid fuels, also under investigation by CalTech for the AAF. Their principal fault is the tremendous smoke produced by their combustion, which is an objectionable military characteristic. Rocket engines using polysulfide fuels develop intense heat when used for periods of longer than a second or so.

AMMONIUM PERCHLO-RATE—This is the most promising of the solid fuels under investigation and is judged "8 to 10 times better" than existing fuels. It is being investigated by Aerojet Engineering Corp., a division of the General Tire and Rubber Co. It is also a rubber-base compound with associated smoking difficulties.

AMMONIUM PICRATE—

POTASSIUM NITRATE—This is an extremely promising composite solid fuel on which relatively little test data are yet available. As a composite fuel, both ingredients are required for its reaction, although oxygen is not required as a separate agent.

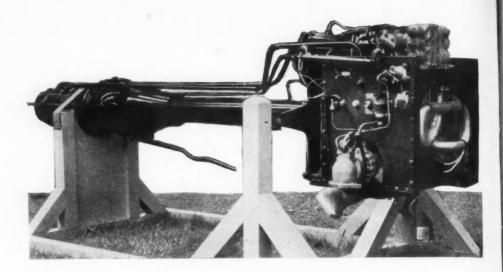
BERYLLIUM BOROHYDRIDE—Under investigation but early tests have indicated it to be a highly corrosive compound with attendant storage, transportation and handling difficulties.

LITHIUM BOROHYDRIDE—This also possesses the highly objectionable characteristic of corrosiveness. It shows promise as a rocket fuel but it is extremely difficult to manufacture.

LITHIUM HYDRIDE—This has been investigated but has revealed a number of difficulties. Its principal fault is the fact that it is not a good producer of hydrogen. Its production is difficult.

Liquid Fuels

The Germans began investigations into liquid rocket fuels for military purposes long before our Services began to take an active interest in the problem. Experiments began in Germany in 1929 by private scientists and the Army Weapons Group of the German General Staff became officially interested in 1933. The well-known research and experimentation station at Peenemunde was constructed in 1937-38 at a cost of 300 million marks and development work on liquid rocket fuels began on a comprehensive scale. Our Services did not begin serious rocket investigation until after Pearl Harbor. For this reason most of the information now in the United States comprises captured German documents, examination reports of captured missiles, factories and research installations and interviews with German scientists.



The Walter 109-509A-1 rocket engine which uses the bifuel C-Stoff and T-Stoff described in this article. The C model, equipped with an auxiliary cruising unit, weighs 415 lb and develops a maximum thrust of 3740 lb. Powered by it, the Messerschmitt Me 163C interceptor-fighter had a top speed of 590 mph between 13,100 ft and 39,000 ft and a ceiling of 52,500 ft. Maximum endurance was 12 minutes and takeoff weight 11,280 lb. The Walter engine has two main assemblies—the forward consists of a housing for the turbine, two worm type fuel pumps, a control unit, pressure reducing valve, and an electric starter motor. The rear assembly is the combustion chamber and thrust unit.

Most of the liquid fuel research done by our Services since V-E Day consists of explorations of German methods and the utilization of ingredients suggested by German applications. However, both the War and Navy Departments are now going well beyond these data and are conducting extensive research into entirely new chemical fields as well as processes and operation of rocket fuel systems, engine types and accessory equipment.

One important point, however, is that many of the liquid fuel constituents used by the Germans were far from ideal for the purpose and were, in many cases, ersatz preparations necessitated by the war. They are, therefore, inferior to natural compounds now available in this country. Most of the manufacturing and handling processes we are now using, however, were developed by the Germans, largely on the basis of their vast experience in the organic chemistry and dye industries.

Research presently is being directed towards the development of liquid bifuels for long-range, high-altitude missiles. The principal disadvantage of the monofuel, despite its many superior features, is the fact that it is useless at altitudes above about 70,000 ft where the rareness of the atmosphere and the resulting absence of oxygen prevents combustion of a fuel with the air taken on board. Bifuels, containing their own oxygen supply, are suitable for use even in outer space and permit the rocket to develop its maximum power, which it does in a vacuum. Some rocket liquid fuels follow:

* LIQUID HYDROGEN AND LIQUID OXYGEN—As is well known, this is the theoretically "perfect" rocket liquid fuel and releases something of the order of 51,500 Btu per lb. However, it is without doubt the most difficult rocket fuel to handle and

easily the most dangerous. The liquids cannot be used in the field due to container problems created by the intense cold and high leakage and expansion of the two elements. However, various modified forms of these two powerful ingredients have proved highly successful.

LIQUID OXYGEN AND HYDROCARBONS-The use of alcohol, gasoline, kerosene, methanol, etc., with liquid oxygen has proved successful in Germany, Great Britain and America over the past two decades and provided the liquid fuels for most of the early, independent liquid fuel rocket experiments by such pioneers as Goddard in the United States, Oberth, Sanger, Valier and Hohmann in Germany, Esnault-Pelterie in France, Rynin and Ziolkovsky in Russia, etc. However, their energy output is comparatively low, they are dangerous to handle and are highly corrosive mixtures. The Nazi V-2, the world's outstandingly successful rocket during World War II, utilized liquid oxygen and alcohol, which produced a thrust of well over 600,000 hp at the maximum velocity of the rocket. The advantages of these liquid fuel constituents is their availability on the commercial market, their comparatively low cost and their volatile characteristics minimizes the problems of rocket engine sensitivity. However, other than the instrumented test firings of V-2 rockets at White Sands Proving Ground, New Mexico, now in progress, these fuels have been superseded in both the Army and Navy and further research has been dropped.

HYDROGEN PEROXIDE—This is not a rocket fuel itself but is a convenient and safe method of providing oxygen for a liquid fuel reaction. Its principal fault is its lack of stability and it quickly decomposes into hydrogen and oxygen even within a container. In the V-2 rocket the Germans used a

highly concentrated hydrogen peroxide-water solution in combination with a permanganate of either potassium or calcium, the heat from the reaction of the mixture converting the water into steam to drive the turbine which operated the main fuel pumps. An 80 per cent concentration of hydrogen peroxide in water, known as T-Stoff, also was used as one agent of the bifuel in the Walter rocket engine system. This solution was stabilized with phosphoric acid.

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RIES

HYDRAZINE HYDRATE

—A reaction of hydrogen
peroxide oxidizing directly
into another substance is
rather difficult to obtain.
but the German H. Walter,
of Kiel, solved this problem
through the use of hydrazine hydrate. When the
two combine, gases are gen-

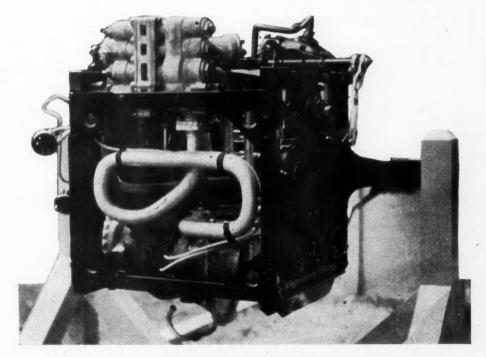
erated with the desired high percentage of low molecular weight materials, resulting in high energy release. The Germans discovered, however, that the two agents did not react readily and resulting ignition delays often caused explosions and a number of casualties. To aid reaction the Germans used copper salts operationally, having tried sodium nitroprusside and other catalysts.

Walter developed a compound known as C-Stoff, a combination of 57 per cent hydrazine hydrate, 30 per cent methanol and 11 per cent copper salts (potassium cuprocyanide). This was mixed with T-Stoff to provide the liquid fuel for his highly successful HWK 509 rocket engine. This unit was used to power the Messerschmitt Me 163 interceptor-fighter and the Bachem BP-20 Natter piloted anti-aircraft missile. The Walter engine weighs only 415 lb, yet develops a maximum thrust of 3740 lb. The unit provided both a main jet for maximum thrust and a cruising jet (thrust = 660 lb) of smaller dimensions to provide lower fuel consumption.

The combination of T-Stoff and C-Stoff is an extremely satisfactory rocket liquid fuel. Combustion is smooth with no solid by-products residue. It starts quite easily, in the presence of the catalyst, and is easily stored, transported and handled. It is simple to manufacture by the oxidation of ammonia by sodium hypochlorite and can be prepared synthetically. Its only adverse characteristic is its corrosiveness.

NITRIC ACID AND HYDROCARBONS—Bayer-ische Motoren Werke, pioneer German aircraft engine manufacturer, experimented with liquid fuel rockets during the war. The most promising of their fuels is Tonka, a heavy hydrocarbon with additional substances of a wide variety designed to produce

(Turn to page 76, please)



Closeup of forward end of Walter rocket engine shown on preceding page.

Engineering Features of New

Dodge Heavy Duty Truck Specifications

Sales Symbol, Wheelbase, and CA Dimension

21/2-Ton:	Symbol WJ55 WJ56	WB, ii 136 142	60	A, in. 11/16 11/16
	WJ57 WJ58 WJ59	160 178 235	84 102	11/16 11/16 11/16
3-Ton Dodge:				,
20.000 GVW	23,000 GV	rw		
WK65	WR65	136		11/16
WK66	WR66	142		11/16
WK67 WK68	WR67 WR68	160 178		11/16 11/16
WK69	WR69	196	120	11/16
		2½ Ton (WS Series)	3 Ton	3 Ton Heavy
ENGINE-		(44.2 201102)	(AAK Series)	(WR Series)
No. cylinders		6	6	6
Max torque, lb-ft at rp Bore and stroke, in Displacement, cu in	m	115 at 3200 225 at 1200 3.750 by 4.25 282	128 at 3000 270 at 1200 3.750 by 5.0 331.35	128 at 3000 270 at 1200 3.750 by 5.0 331.35
Compression ratio		6.5 to 1	6.5 to 1	6.5 to 1
CLUTCH—		40	**	
Disk nominal diam, in. Facing area, sq in		12 139	13 178	13 178
No springs		16	16	16
TRANSMISSION		5-speeds fwd.	5-speeds fwd.	5-speeds fwd.
FRONT AXLE-				
Rated capacity, lb:				
Standard		4500	5500	7000
Optional		5500	7000	****
Single reduction: Ratio Capacity, Ib		6.8 or 7.2 14,000	6.83 or 7.4 16,000	6.83 or 7.8 18,000
Two-speed double red	uction:			6.53 and 8.53
Capacity, lb	eduction:	14,000	16,000	18,000
Ratio		8.15	8.2	8.53
Capacity, Ib	******	14,000	16,000	18,000
SERVICE BRAKES—		10 0 5	10 5 0 5	10 1 0 5
Front wheel, in		16 by 2.5 16.25 by 3.5	16 by 2.5 16.5 by 4.0	16 by 2.5 16.5 by 5.0
Area, sq in		306.3	424.3	473.3
Diaphragm type	•	single	dual	dual
Diaphragm diam and			9.5 by 4.0	9.5 by 4.0
Slave piston diam, i	n	0.875	1.062	1.062
HAND BRAKE-				
Drum diam, in Lining width, in		9.5	9.5	9.5
Area, sq in		2.5 73.75	4.0 118	4.0 118
STEERING GEAR-		10110		110
Type		worm and	cam and twin lever	cam and
Ratio			19.5 to 1 at each end 23.4 to 1 at center	19.5 to 1 at each end 23.4 to 1 at center
Max rear tire size, in		9.00-20-10	10.00-20-12	11.00-20-12
Gross vehicle weight, Ib			20,000	23,000
Gross train weight, lb	********	32,000	37,000	37,000

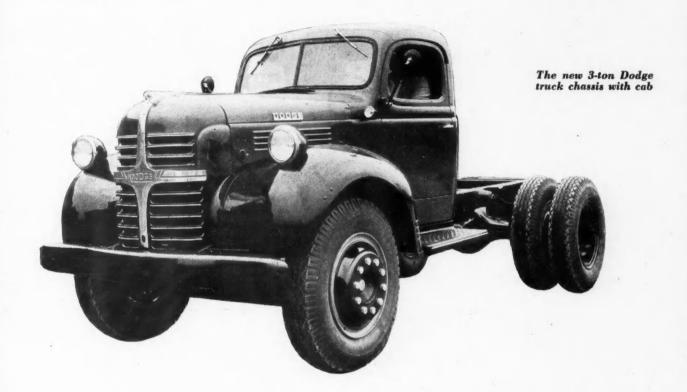
HREE heavy-duty trucks—a 2½ ton rated 18,000 lb GVW in five wheelbases ranging from 136 to 235 in.; a 3-ton of 20,000 lb GVW in five wheelbases ranging from 136 to 196 in.; and a 3-ton heavy of 23,000 lb GVW in the same range of wheelbases as the 20,000 lb model—each available in 10 different models, have been announced by the Dodge Div., Chrysler Corp. Specifications for these trucks are given in the accompanying table.

The engines have sodium-cooled and Stellite-faced exhaust valves operating in Stellite-faced inserts. Intake valves are of Silchrome and operate in Silchrome inserts. The camshaft is driven by wide helical gears, the latter being encased by a malleable iron cover with provision for attaching a mechanical governor. The fan drive pulley is marked with the degrees of crankshaft rotation to facilitate valve timing.

Pistons are aluminum alloy, of the "Auto-Thermic" type, with steel struts to control skirt expansion. They are fitted with four rings - three compression rings and an oil control ring at the bottom. The top ring is chromium-plated and said to increase ring and bore life from three to five times. The next two rings have tapered faces and serve as oil scrapers as well as compression rings. The bottom ring is a wide oil control ring, said to resist clogging for long periods of operation.

The cylinder block is made from chrome nickel-molybdenum alloy cast iron. The seven-bearing drop-forged crankshaft has nine counterweights and is statically and dynamically balanced. Journals are Tocco-hardened to a reading of 55 to 60 R_c. Main bearings as well as connecting-rod bearings are of so-

Dodge 21/2 and 3 Ton Trucks



called "multiple-layer" type — steel back, precision bearings with copper-lead bonded to the steel back, and a coating of lead-tin alloy bearing metal bonded to the copper-lead matrix.

The intake manifold has six ports to improve mixture distribution to each cylinder by taking advantage of intake ram. It is said to provide high power and torque over a wide speed range with improved economy. The exhaust manifold is of three-piece slip joint design to compensate for expansion and contraction, and employs a piston-type seal at the joints. This is said to eliminate manifold cracking.

The carburetor is a downdraft plain tube model with an integral governor and fuel filter. One throttle blade serves for both governor and carburetor control. The filter is of brass disk type. Fuel is supplied from a 25-gal tank mounted outside the frame on the right side and is pumped by a multiple-valve fuel pump of large capacity to prevent vapor lock. Fuel lines, vacuum lines, and wiring are carried inside the frame side rail as protection against breakage, heat, and weather.

Engine lubrication is of forced-feed type, protected by a floating type screen in the sump. Oil sump capacity is 10.25 qt.

Adequate provision for engine cooling is offered by use of a cellular radiator core with a frontal area of 474 sq in., three in. thick for the 2½-tonners and four in. thick for the three-tonners, mounted on a malleable iron support. A pressure-type cap is used. Water pump is of large capacity, six-blade impeller type, with the shaft mounted on two ball bearings. The seal is of permanent bellows type.

The fan is driven by two rubber fabric belts to prevent slippage and to increase belt life. The fan is 19 in. in diameter, with four blades on the $2\frac{1}{2}$ -tonners and six blades on the three-tonners. The thermostat is $3\frac{1}{4}$ in. in diameter.

Protection against dirt is offered by the following features: (1) Oil filler pipe flanged at bottom and bolted to the block; (2) Air filter-type oil filler pipe cap; (3) Oil level indicator extension tube and dust-proof cap at top; (4) New crankshaft front end oil and dust seal; (5) One-quart capacity oil bath carburetor air cleaner attached by bolts; (6) Heavy valve compartment covers, each held with 10 screws.

The five-speed transmission is equipped with two power take-off openings, one on each side, to provide drive outlets for hoists, power tire pumps, air compressors, winches, and other equipment.

An exceptional feature of these models is the adoption of the Timken "3-for-1 Related Design" rear axles in which three basic types of final drives—hypoid bevel gear single reduction, hypoid two-speed helical double reduction, and the hypoid single speed helical gear double reduction—can be used interchangeably in the same axle housing for the same load capacity range. All three final drives in each capacity use many of the major parts interchangeably.

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Two views of "autothermic" aluminum alloy piston with steel struts to control skirt expansion



The basic axle housing is a high-carbon steel, rectangular forging. The brake mounting flange is forged integrally with the outer end spindle which is welded to the housing. The straddle-mounted pinion is short and is rigidly mounted on two tapered roller bearings at the outer end and on a radial roller bearing at the inner end. The tapered roller bearings are pre-loaded by means of a spacer. The differential is a four-pinion, 9—16 tooth combination with large diameter gears. The axle shaft is a one-piece forging with an integral driving flange and 16 shallow-depth splines at the inner end. The flange is positively locked to the hub by heavy driving studs and taper locks. The two-speed double reduction unit is equipped with an easy power shift which is vacuum-actuated.

The service brakes are hydraulic-booster actuated. Service brakes for front wheels are of the standard Dodge design—two-shoe, double-anchor, equal-pressure type. The rear brakes are of the "dual-primary" float-

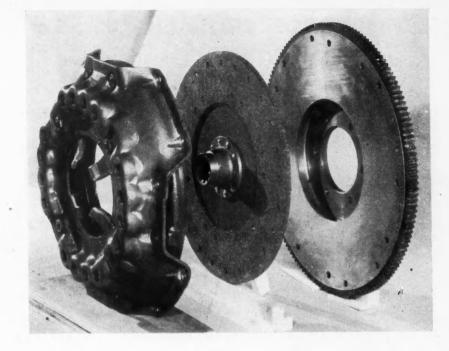
ing-shoe type designed to give equal self-energization of both brake shoes in forward and reverse. In this design, pressure from the wheel cylinder is applied to the upper ends of two brake levers forcing the two floating brake shoes into engagement. Since the shoes are not anchored and pressure is applied at their midpoints, they are self-centering at the instant of contact. The natural tendency of the shoes to follow the drum in the direction of its rotation is prevented by self-aligning abutment blocks which bear against the ends of the shoes. The booster for service brakes is a completely sealed system with all connecting lines of steel tubing, with the remote breather located under the cab seat. Full air brake system is available on all models as extra equipment.

The hand brake, mounted on the rear of the transmission, has a cast iron drum with a lip on the front edge to prevent entry of grease to the brake lining. Lining is of woven asbestos, 5/16 in. thick.



Crankshaft and camshaft setup for 3-ton truck engine. The crankshaft has nine counterweights and is supported by seven multiple layer bearings, consisting of a steel back, a layer of copper-lead alloy and a layer of lead-tin alloy bonded together

Clutch parts and flywheel on the 3-ton truck



Propeller shafts are of heavyduty cross-and-trunnion type with cageless roller bearings and provided with grease fittings on the crosses and slip splines. The propeller shaft center bearing, used on all except the short wheelbase models, has a large capacity ball bearing encased in rubber.

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RIES

Frames are of medium high carbon pressed steel with side members 5/16 in. thick, 8 9/32 in. deep and 2% in. flanges. They are straight and made in a standard 34 in. width to facilitate mounting of standard and special bodies. "L" shaped side rail reinforcements are standard equipment for 2½-ton in 178 and 235 in. wheelbase, and for all 3-tonners, but are available as extra equipment on the 2½-ton 136, 142 and 160 in. wheelbases.

All spring leaves are of Amola steel, the second leaf of the front spring at the rear end being wrapped around the eye. Rear springs are a combination of main and auxiliary springs.

Direct-acting hydraulic shock absorbers are installed as extra equipment for the front on 136 in. and 142 in. wheelbase models, unless otherwise specified, and are available as extra equipment for other models.

The battery is on the left side under the floor board, in a ventilated area and readily accessible. On $2\frac{1}{2}$ -ton-

ners, the battery is 17-plate, 136-amp hr capacity; for three-tonners it is 19-plate, 153-amp hr capacity. The generator is of 35-amp capacity, of air-cooled type, with voltage and current regulation.

Wheels are of ventilated disk type with integral full wide base rims which are said to contribute to safety and increased tire life. Dual wheel spacing for 6.00 rims is 11 in.; for 7.00 in. rims, 13 in.

The cab is of all-steel construction, flexibly mounted with coil springs on three of the four mounting bolts. The full width seat is adjustable and has deep, well-padded cushions. The seat cushion is air-bound and provides control of the volume of trapped air by a manually operated valve in the panel, thus enabling the driver to adjust the seat to suit his weight as well as road conditions. The cab is sealed and insulated against weather, dust, and noise. Windshield is of V-type which can be opened for ventilation. Electric windshield wiper and outside rear view mirror are standard equipment.

Pneumatic Fatigue Tester Operates at High Temperatures

A PNEUMATICALLY operated fatigue testing machine has recently been developed at the Schenectady Works Laboratory of the General Electric Co. Originally developed to test gas turbine buckets, metals can be tested over a range of temperatures from below zero to 1700 F.

The operating mechanism of the new instrument consists of a tuned air column in which the tuning is accomplished by decreasing the length of the air path, much as a trombone player changes the tone of his instrument by moving the slide. The part to be tested is placed in such a position between the two air paths or tubes that the

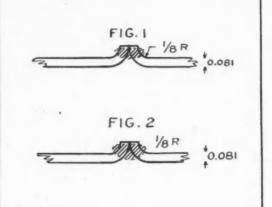
air from the open ends strike on the upper end of the sample piece, setting it to vibrating. Since the piece vibrates at the same frequency as the note in the testing trombone, and air is continually fed through the tubes, the air impulses will cause continuous vibration of the test piece. Adjusting the tubes length so that the air in them vibrates at the same frequency as that of the test sample makes it possible to produce very large and stable amplitude sof vibrations with comparatively small amounts of air.

The sample vibrates, of course, until it fatigues to the extent that its vibrations are out of phase with those

of the tuned air and a break occurs.

The pneumatic fatigue tester has produced stresses as high as 100,000 psi, with no more air being used than that supplied by the average vacuum cleaner. The tester has no parts to wear out, as nothing moves but the part to be broken. Three different models have been built, the one described, one that has proved especially efficient for torsion testing, and one for strip testing. All of them operate on the same principle, but differ in size and arrangements for holding the piece to be tested.

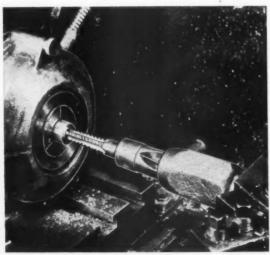
Current research with the pneumatic (Turn to page 96, please)



Results of a group of tests, conducted by North American Aviation, Inc., to determine the suitability of carbon arc flange welding of aluminum for high strength design purposes and to establish typical physical properties, reveal that carbon arc flange welding is suitable for high strength design. The tensile strength averaged 1000 lb. per linear inch of weld, which is considered satisfactory. Aluminum alloy, 3S-O with a 0.12 in. flange radius plus 0.06 in. excess material on the flange is recommended. The type of weld giving the highest properties is illustrated in Fig. 2. The weld shown in Fig. 1 is undesirable and results from insufficient stock material or inadequate "welding down." Porosity can be maintained at a minimum by keeping the metal molten long enough for the gas to escape.

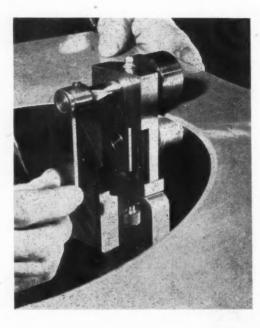
Fig. 1—Illustration of small weld zone due to insufficient melting. The bead is high on the flanges and there is not enough melted material between the flanges.

Fig. 2—Example of a proper weld with a large fusion zone. The flanges are well melted down and sufficient material has solidified between them.



1

Short



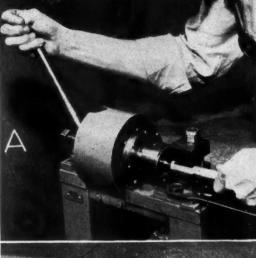
An ingenious device with which sheet metal up to 16-gage may be crimped either at the bench, on the job or after installation, has been perfected at The Glenn L. Martin Co. The tool will work equally well on straight-edged metal, sheets or pieces curved to any shape, on the inside of blanked-out holes or wherever crimping on sheet metal may be required. Two round dies, one with a projecting edge, the other rounded to fit, are held together by spring tension and an adjustable screw to fit them for various thicknesses of metal. Turning a crank pulls the metal sheet between the dies. Held firmly against a guide, the edge of the metal is crimped to the desired shape. The tool may be operated by clamping it in a bench vise, probably its most widely used place. By substituting a wheel for the conventional handle (with little sacrifice in leverage) it also can be used right on the piece needing crimping after it has been installed in the airplane, or a new crimp can be put into a piece of sheet metal without having to completely remove it from the ship.

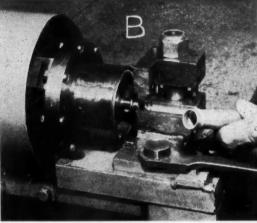
At the Westinghouse Electric Corp. is a new method of tapping a special bronze nut has tripled production and greatly decreased the number of defective parts. The unit has a 0.750 in. ID, a 1.120 in. OD, and is 1.875 in. long; it has a quadruple 29 deg Acme thread, a 1.0 in lead, and a 0.250 in. pitch. When the nut was first put into production an attempt was made to chase the threads on a lathe with a single point cutting tool. Because of the percentage of scrap, a series of five taps were developed to cut the thread. Instead of chasing the threads in a lathe they are now tapped on a Universal turret lathe in five steps. To facilitate tapping, the threads on both the nut and screw are cut to three-quarters of the full depth. Notches on the shanks of the taps aid the operator in using them in the proper sequence.

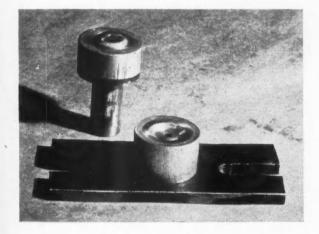
Cuts

A machine which will bead or flare a metal tube in less than one min has been developed at the Ryan Aeronautical Co. A complete set-up of the machine can be made in less than 10 min and inexperienced workmen can operate the device with practically no spoilage of material. Small tubes up to 1.25 in. diam, either straight or prebent, may be worked. The tube is firmly held during the operation by a split female die. The upper part is connected to a pedal, operated by the workman's foot, and serves as a quick-acting clamp. The male die is mounted in a chuck driven by a 0.25 hp electric motor and is fed into or out of the tube by a hand lever. For beading, the male die is turned in an eccentric circle against the inside of the tube. For flaring, the male beading die is replaced by a cone-shaped flaring tool, as shown in the accompanying photo.

A-Setup for flaring operation. B-Beading setup.

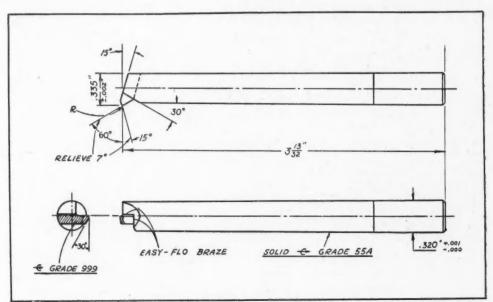






Solid Carboloy boring bars made to the specifications in the accompanying sketch have been used to semi-finish and finish bore deep small-bore holes in cast iron valve guides having a 7.3 to 1 ratio of length of bore to diam. Feed was 0.002 in. per revolution for both semi-finish and finish bore. The finished holes were round, straight, concentric, and held to a tolerance of 0.0002 in.

These Ryan dimpling dies, minus pilot pins, are set up in punch press and used to remove "oil can" effect that frequently occurs in the fabrication of metal sheets. The dimples take up excess metal and add rigidity to the offending area.



IES

Rise and Decline of the

T THE turn of the century the relative advantages of the three most available motive powerselectricity, steam and gasoline-were a much discussed topic. Steam excelled by reason of its flexibility and silence, and what impressed people most was the power of the steam car on hills. A most effective demonstration of the steamer's climbing power was given when F. O. Stanley, accompanied by Mrs. Stanley, on August 31, 1899, ascended Mount Washington, the highest mountain in New England, in one of the little steam cars, a feat which was reported all over the country. The summit is about 6300 ft above sea level, and the ascent involved a climb of 6000 ft. This rise extends over a distance of 10 miles, so that the average grade is about 12 per cent. It took 2 hr 10 min. to make the ascent, including the time spent in replenishing the water supply en route.

In 1900 the Locomobile Company acquired a large tract of land at Seaside Park, Bridgeport, Conn., on which it erected a four-story brick factory building. The plant was occupied in May, 1901, and became the headquarters of the company. John Brisben Walker's concern, the Mobile Company of America, acquired a factory site at Kingsland Point, Tarrytown, N. Y., where a three-story brick factory was erected (which later became the nucleus of the General Motors Eastern assembling plant). When the plant at Bridgeport was completed, Locomobile manufacturing operations

were concentrated there, and the plant at Newton, Mass., reverted to the Stanley brothers, who then engaged anew in the manufacture of light steam cars for their own account. Under the management of S. T. Davis, Jr., son-in-law of Mr. Barbour, the Locomobile Company soon rose to a position of leadership in the industry. It inaugurated a forceful publicity campaign, and the car quickly became known, not only throughout the United States, but in foreign countries as well.

A longitudinal vertical section and a plan view of the powerplant of the Locomobile are shown in Figs. 2 and 3 respectively. The vertical fire-tube boiler A is located under the seat, and the gasoline burner B is attached to it at the bottom. Water is carried in tank C, which partly surrounds the boiler and fills the rear of the body space. Gases of combustion pass from the fire box between burner and boiler through the copper tubes of the boiler into flue D, which extends toward the rear and has two outlets, E and F. When steam is being raised with the vehicle at rest, the flue gases are discharged upward back of the seat, but when the vehicle is in motion they are discharged downward at F, so they will not annoy the occupants. To this end the exhaust pipe from the engine is carried into the vertical discharge flue, where it terminates at G. Discharge of the exhaust produces an ejector effect, which carries the flue gases along with

the steam. Locating the water tank so that it partly surrounds the boiler, and discharging the exhaust steam and flue gases through it, causes some of the waste heat to be transferred to the water, preheating it and reducing the fuel consumption.

The burner B is essentially a multiple-unit Bunsen burner. It is a flat cylinder of the same diameter as the boiler, the headers of which are connected by numerous air tubes. Gasoline from the tank is first passed through a pipe through the boiler. It there absorbs sufficient heat so that when it issues from the nozzle at the end of the fuel tube it flashes into vapor. The discharge end of the fuel pipe is located within a larger pipe entering the burner from the side, through which air

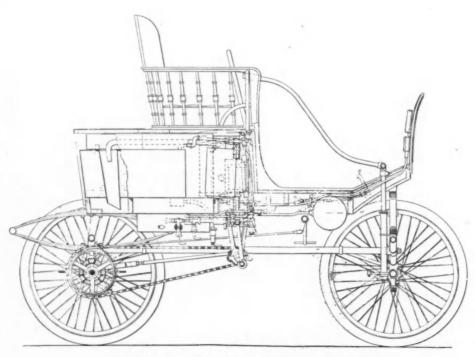


Fig. 1-Cutaway side view of the Locomobile steamer

American Steam Car Industry

By P. M. Heldt

Part Two

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TRIES

Part I appeared in the August 1 issue. Part Three will appear in the September 1 issue.

is drawn by the injector effect. This air mixes with the fuel vapor and forms an over-rich mixture which issues through numerous fine drill holes surrounding the air tubes in the upper header. There this over-rich mixture combines with additional air rising through the air tubes, to form a substantially perfect com-

bustible mixture which burns in the fire box and in the boiler tubes. When starting from cold the fuel cannot derive any heat from the boiler, and use is then made of a so called "torch," which consists of a U tube that is inserted through an opening in the side of the burner and so connected that the fuel must pass through it on its way to the mixing tube. This torch is previously heated to redness in a furnace or in any other convenient manner.



F. O. Stanley and Mrs. Stanley are shown in this view taken on top of Mt. Washington

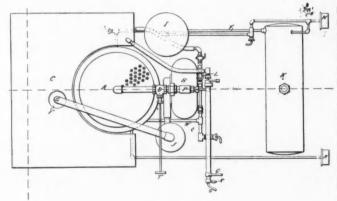
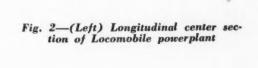
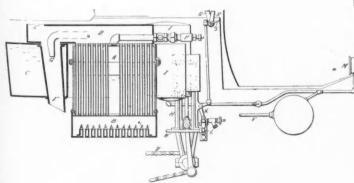


Fig. 3—(Above) Plan view of Locomobile powerplant





August 15, 1946

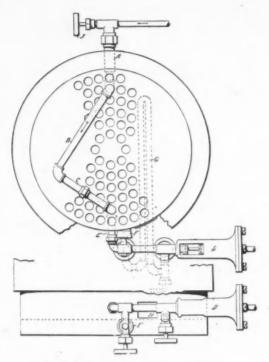


Fig. 4—Fuel vaporizing and control system in plan and section

A, fuel pipe entering boiler casing; B and C, connections for vaporizing pipe; D, automatic pressure regulator; E, pipe connection to pressure regulator; F, mixing tube; H, opening in fire box for introduction of starting torch; J, shut-off valve in fuel line.

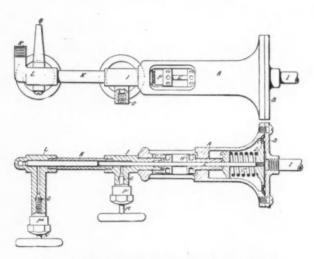


Fig. 6—Plan and section of automatic pressure regulator

A, body casting; B, head plate; C, sheet-steel diaphragm; D, metal block resting against diaphragm; E, valve stem; F, coil spring; G, spring plate; H, adjusting screw; I, pipe to water space of boiler; J and L, T-fittings; K, nipple; M and N, needle valves; O, tapped boss; P, P', P", caps of stuffing boxes; Q, nozzle and passage to nozzle.

Fig. 7—(Right) Front and side elevations of steam engine

A, A, cylinders; B, valve-chest cover; C, piston; D, slide valve; E, piston rod; F, stuffing box; G, frame member; H and I, frame studs; J, J, bearing bosses of frame; K, K, crank arms; L, L, connecting rods; M, crosshead; N, N, crosshead guides; O, O, P, P, eccentric rods; R, reversing link; S, valve rod; T, stuffing box; U, sprocket pinion; V, steam pipe; W, exhaust pipe.

Sometimes the fire would become extinguished while the car was parked away from home, and finding a means of heating the torch to redness was then quite a problem.

The two-cylinder vertical engine H is located directly in front of the boiler and drives by chain V to the differential at the center of the rear axle. The cranks of the engine are set at 180 deg. and the engine therefore has dead centers. Occasionally it would stop in dead center, and opening the throttle then would not start the car either backward or forward, even though there might be full pressure in the boiler. This sometimes proved very puzzling to novices, who had to send for an "expert" to get them out of their predicament. To the experienced driver it was a matter of little moment, because all that was necessary was to push the car a few inches in one direction or the other to get the engine off dead center.

Steam from the boiler passes through an auxiliary valve O and the throttle valve P to the engine. The early Locomobiles did not have the auxiliary or shut-off valve. Exhaust steam from the engine passes through the muffler J to the discharge flue F. In some of the later designs the muffler was developed as a feedwater heater by placing a pipe coil in it through which the feed water was passed on its way from the tank to the boiler.

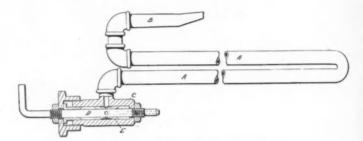
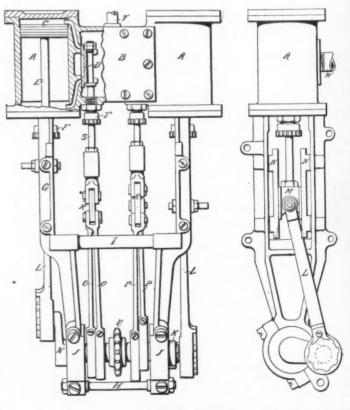


Fig. 5—(Above) Starting torch

A. A. U-tube; B. Nozzle; C. T-fitting; D. threaded rod for attaching torch to pressure regulator; E. sleeve between rod and T-fitting.



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Fig. 8—Stephenson-link reversing gear in forward and reverse positions

A, crankshaft; B, C, eccentrics; D, E, eccentric rods; F, link; G, link block; H, fork; I, valve rod; J, frame member; K, reversing bell crank; L, link; M, crank; W, connecting rod.

Gasoline was carried in the tank K under the floor boards. Fuel was fed to the burner by air pressure, an air tank T being provided for the purpose. Air pressure of about 35 psi was pumped up in this tank by means of a bicycle pump, the hose of which was connected to a nipple located on the dash close to the pres-

sure gauge M for the air tank. Another gauge N on the dash indicated the boiler pressure.

Water from the tank was fed to the boiler by a plungertype feed pump L, which was operated from the crosshead of the engine. As the plunger was directly connected to the crosshead, the pump operated as long as the vehicle was in motion. It was designed to have a somewhat greater capacity than required to maintain a constant water level in the boiler under normal driving

Fig. 10-Ball-bearing crank assembly

A, crank; B, shaft; C, retaining screw; D, screw locking plate; E and F, cups of crankshaft ball bearing; G, mounting ring of ball bearing; H, locking plate; K, crankpin ball bearing; L, adjustable cup of crankpin ball bearing; M, connecting rod; N, saw slot in connecting rod; O, connecting rod clamp screw.

conditions, and was provided with a bypass valve through which the water delivered could be returned to the tank when the water level in the boiler was at or above normal.

For the control of the powerplant there were three short levers or handles on the outside of the body at the right of the driver, secured to concentric shafts. Referring to Figs. 2 and 3, the center shaft, operated by lever S, controls the bypass valve. The lever next to it, R, controls the reversing gear of the engine, a Stephenson link motion, while the remaining lever, Q, controls the throttle valve. The car was steered by a tiller and had a band brake operating on the drum of the differential gear, which was applied by a pedal. One end of the brake band was fixed, and the operating pull was applied to the other end, which made the brake quite powerful under forward motion, but rather ineffective under reverse motion.

Pipe connections from the upper and lower parts of the boiler were made to a water gauge outside the body on the driver's side. The driver observed the water level in the gauge through a mirror located on the dash. Breakage of gauge glasses was a frequent occurrence, and to prevent blowing off of the boiler on such occasions, conical check valves were placed in the pipe connections. Unfortunately, these check valves had a habit of rusting to their seats. When this occurred, the water level in the gauge would remain absolutely constant, while ordinarily it varied continuously, and the experienced driver would

know at once what was wrong. With a novice at the wheel it was not uncommon for the boiler to run dry and burn out while the gauge indicated a normal water

Fuel feed to the burner was regulated automatically by a valve under the control of a diaphragm. The latter was subjected to boiler (Turn to page 102)

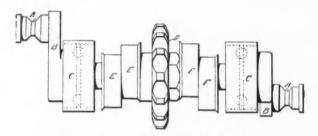
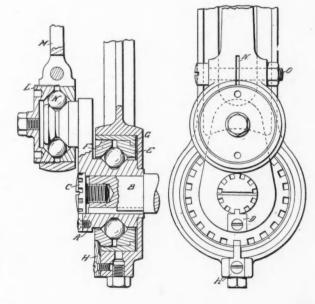


Fig. 9—Crankshaft assembly of engine
A, A, crankpins; B, B, crank arms; C, C, ball
bearings of crankshaft; D, sprocket pinion; E, E,
F, F, eccentrics.



TRIES

By B. F. Raynes

Tooling Superintendent, Rohr Aircraft Corp.

HE Rohr MO-1 airplane is two-place, side by side, incorporating all-metal construction with cantilever wing surfaces and retractable tricycle landing gear. The design is a Canard type with stabilizing surfaces forward of the wing and incorporates a submerged engine installation under the wing and just aft of the passengers. The engine drives a blower and a pusher propeller at crankshaft speed. The blower draws in air from slots around the fuselage and forces this air across the engine and through the fuselage into the wings. The wings are air tight and act as ducts to transmit the air under pressure to full span slots located on the upper surfaces at the 80 per cent chord point. Air under pressure is likewise transmitted to the front surface which has a full span pressure slot in the upper surface. Engine exhaust is transmitted along with additional air under pressure to a pressure slot around the fuselage just forward of the propeller spinner. The variable pitch propeller and blower are mounted on a common shaft and a clutch is provided between this shaft and the engine. In the event of power failure, the propeller is used as a windmill and provides the power required to operate the blower.

The MO-1 has no movable vertical surfaces. To negotiate a left turn, the wheel is turned to the left

General Specifications of the MO-1

Wing span	24	ft
Stabilizer span	6.5	ft
Overall length	16.5	ft
Empty weight	495 lb	
Gross weight	1010	1b
Wing area	60	sq ft
Landing speed	40	mph
Top speed	150	mph
Engine	65	hp

A Canard

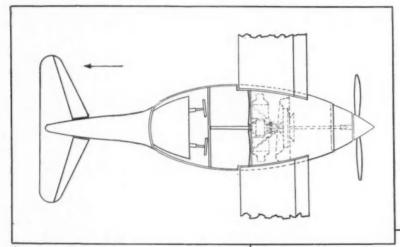
which partially closes a flapper valve in the air orifice leading to the left wing. This causes a reduction of C_P * and C_L in the left wing and an increase of C_P and C_L in the right wing, and is accompanied by a differential jet effect producing yaw in the required direction. Change of C_L in each case is effective over

the entire semi-span.

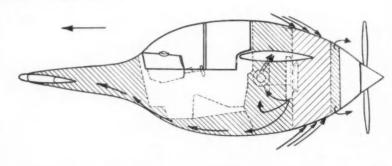
Control of the boundary layer about the wing produces several beneficial effects:

- Lateral control may be maintained at high lift coefficients.
- 2. Favorable yawing moments are produced.
- 3. High maximum lift coefficients are possible.
- 4. The angle of attack required to attain a given lift coefficient is reduced.

^{*} Cr is a coefficient representing the ratio of the pressure inside the wing to the dynamic pressure.

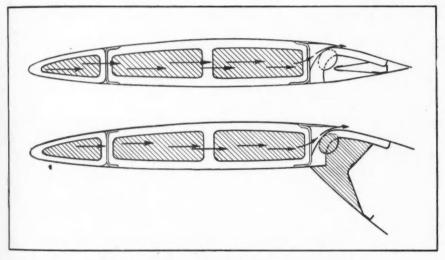


(Above) Top view showing engine and blower installation. (Right) Air is drawn in from slots around the fuselage by a blower which forces this air arcross the engine and through the fuselage into the wings.





Type Light Personal Airplane



Airflow inside the wings. Bellows operate the flaps.

5. The profile drag coefficient is reduced.

Satisfactory lateral control at high lift coefficients has been one of the most perplexing problems confronting aircraft designers. The lateral control system used in the MO-1 produces rolling moments available at low speed that are greater than those at high speed due to the increase in C_P at low speed. A favorable yawing moment is produced by the differential jet effect. The relationship between yaw and roll can be most readily changed by shifting the chord-wise location of the exit slot, and to a lesser extent by varying its size. High maximum lift coefficients are beneficial in several ways in that low landing speeds can be used without resorting to large wing areas with their attending disadvantages in the high speed range as well as increased production cost. The small wings

used on the MO-1 simplify the storage and handling problems.

Towed-in wing end plates are used to produce directional stability. Pitching moments are produced by movable elevators attached to a fixed stabilizer on the nose. The stabilizer elevator combination operates at a higher coefficient of lift than the wing and has a much lower aspect ratio. Both of these factors create longitudinal stability. The low aspect ratio front surface has a flat lift curve slope. The quarter chord line of the stabilizer elevator combination is swept forward 10 deg. Sweep forward produces a flat peaked lift curve which is desirable in reducing the tendency of a

Canard design to oscillate following stalling of the front surface. The weight balance and lifting forces are distributed in such a manner as to render stalling of the main wing impossible. With the wheel in full nose-up position, the lift coefficient of the front surface will increase to its maximum and be restrained from further increase in angle of attack by a strong nose-down moment produced by the increasing lift coefficient of the wing. It is expected that this system of low aspect ratio swept forward front surface combined with a high aspect ratio wing will produce a non-stalling, non-oscillating airplane. A full span pressure slot is provided on the front surface as a means for producing the high lift coefficients required for balancing the nose-down moment caused by the flap.

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August 15, 1946

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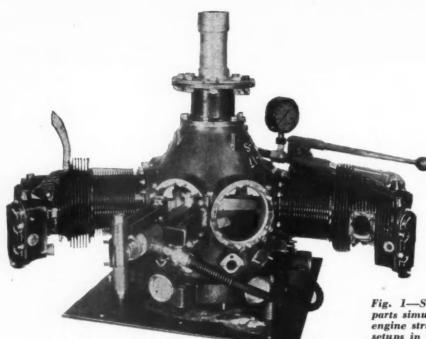
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Continental Finds

By Joseph Geschelin

Fig. 1—Stresscoat testing of Continental engine parts simulates actual operating conditions in the engine structure. This view shows one of the test setups in which static loading by hydraulic pressure gives results equivalent to dynamic loading.

THE accelerated development of aircraft and aircraft engines during the war served to emphasize the urgent demand for lowest possible weight of elements combined with adequate physical strength and endurance. This activity proved the shortcom-

ings of conventional design techniques and mathematical analysis when dealing with parts subject to repetitive loading of high intensity operating in the region of the elastic range of engineering materials. Although previous experience and mathematical analysis are valuable guides, it has been found almost impossible to predict with any degree of accuracy the extent and exact locations of stress concentrations when designing a new part.

Among the new techniques brought to bear on this problem is the experimental stress analysis technique developed by the Stresscoat Division, Magnaflux Corp. The method adopted by Continental Aviation & Engineering Corp. embodies refinements which stem from exhaustive work conducted by the Cleveland laboratories of the Aluminum Co. of America.

In this method the test specimen is coated with a brittle lacquer which cracks as the part is strained during the static test. The accuracy of strain measurement with Stresscoat varies according to the skill of the technician. Under controlled atmospheric conditions, a skilled technician may achieve an accuracy of strain measurement of plus or minus five per cent. Without trained technicians and atmospheric control, the accuracy may

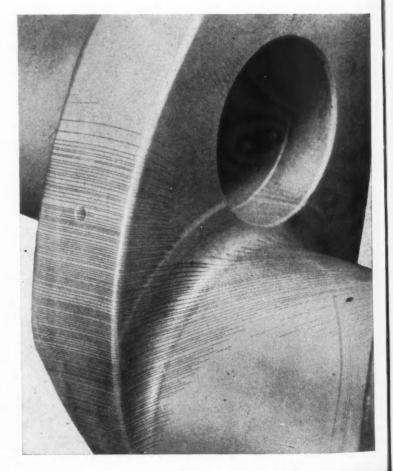


Fig. 2—Stresscoat pattern in a well designed crankshaft statically loaded in torsion. Attention is drawn to the excellent stress distribution and blending of torsional stress lines on the journal with the stress lines on the web.

Stresscoat Analysis

Valuable Guide in Redesigning Engine Parts

vary as much as plus or minus 25 per cent. In this last case the Stresscoating is utilized qualitatively. When greater accuracy in quantitative strain measurement is desired than Stresscoat will yield, the technique is of qualitative value by charting the location and direction of a stress concentration by cracking at

right angles to the maximum principal tensile strain. Once a stress concentration is established, the part is subjected to further laboratory and flight tests, with electric strain gages and extensometers installed at the point charted by initial testing. With proper orientation, wire resistance strain gages and extensometers yield an accuracy of strain measurement of plus or minus two per cent.

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The Stresscoat method is, therefore, a short cut to optimum design since the static test gives results analagous to dynamic loading. Moreover, it permits of a rapid approach to the final design since the

redesigned part can be analyzed quickly in the laboratory to determine the effectiveness of corrective measures.

High sensitivity is another important virtue of Stresscoat, invaluable to the research engineer. The normal range is such as to show indications of unit

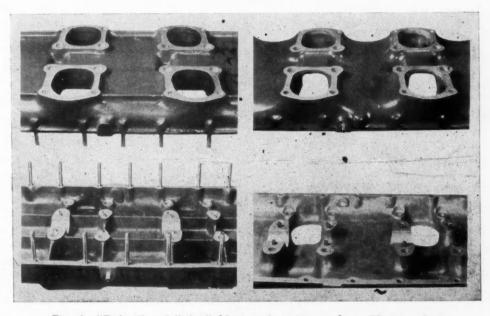


Fig. 4—"Before" and "after" history of engine cambox. The two views at the left show the network of stiffening ribs on the top and inside of the cambox. The two views at the right are of the redesigned cambox with all ribs eliminated but with a better blending of bosses with the structure.

This change increased strength 125 per cent.

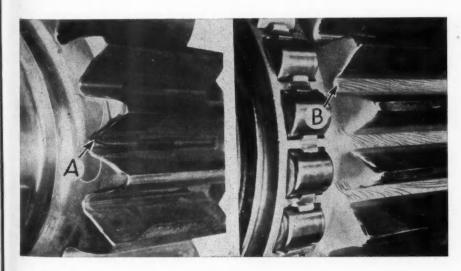


Fig. 3—Initial laboratory testing of an aircraft engine gear gave evidence of stress concentration at the ends of the teeth as shown at "B" in the view at the right. The same gear, after testing, shows incipient failure at the same point.

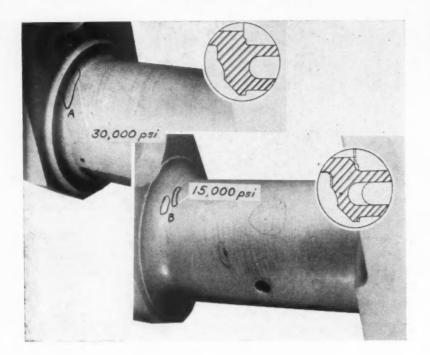


Fig. 5—Strength of this crankshaft was increased 98 per cent by judicious removal of metal in accordance with Stresscoat analysis.

strain of 0.0005 to 0.0006 in. per in. with maximum sensitivity of 0.0004. This implies that a sample need be stretched only to this minute extent to give a complete and usable record. Experience has shown that such analysis with proper loading gives an unfailing clue to potential failures in service.

Continental's experience has shown unmistakably that the usual conception of product design fails to satisfy the requirements of light weight, highly stressed elements. In many cases ribs and stiffeners induce stress concentration — are stress intensifiers instead of strengthening members. Most important of all is the realization that in many instances stress analysis points to a pattern of better utilization of

material—a redistribution of metal—which actually reduces the total weight of the part and gives the lighter part greater durability. It is most impressive to find cases of failures converted to gratifying successes from the standpoint of load-carrying ability and accompanied with a gain in weight reduction by better distribution of metal. Judged by conventional experience this is a paradox since it is more usual in machine design to expect an increase in the size and weight of parts to offset mechanical failure.

Like other scientific methods,

Stresscoat analysis demands skill, imagination, and a clear understanding of the service requirements of the parts being studied. Selection of the proper type of coating and skill in its application to the work also are important considerations. Finally, it is necessary to develop the ability to produce and diagnose the photographs in much the same way as the medical specialist must acquire the ability to analyze an X-ray of the human body.

With this preliminary background, let us consider a few examples of studies made recently at Continental. First, it is important to note that the testing of all parts is done in their normal environment in an engine so as to eliminate variables caused by structural flexi-

bility. Fig. 1 is an example of a test setup designed to simulate the dynamic loading of critical elements of an airplane engine, using the basic engine for the purpose. Load is applied by hydraulic pressure, the magnitude of loading being determined by the actual operating loads in flight. Similar setups are employed for the testing of other parts.

An example of good stress distribution in a well designed crankshaft is found in Fig. 2. This specimen was coated with Stresscoat and statically loaded in torsion. The uniform pattern of stress distribution is apparent. Note the uniformity of stress lines along the web adjacent to the journal and the pattern of torsional strain lines on the surface of the journal

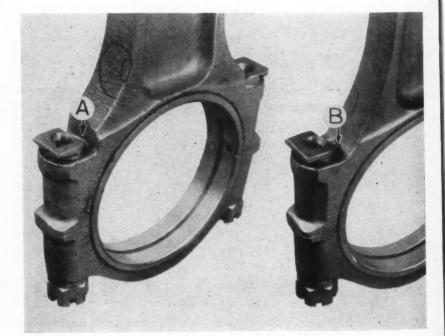


Fig. 6—"Before" and "after" study of blade rod, showing how metal removal on the side of the rod to relieve stress concentration at the bolt head increased strength over 100 per cent.

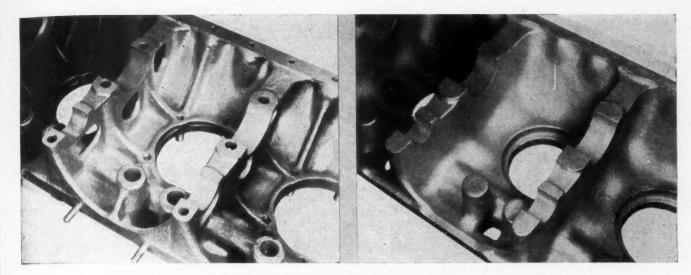


Fig. 7 (Left)—Aluminum crankcase as originally designed with its network of stiffening ribs and lightening holes in the diaphragms.

Fig. 8 (Right)—Same crankcase after stress analysis features absence of ribs and development of well blended sections. Following redesign, it was found possible to use magnesium instead of aluminum with a consequent weight reduction of 27 per cent.

blending with the fillet and web pattern. It also is of interest to find indication of stress lines on the inner and outer surfaces of the lightening hole.

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This method also has been applied to highly stressed gears, one example being shown in Fig. 3. In the view at the right, "B" shows the stress concentration at the edge, at the corners and in the fillet. Upon examining the photograph the research engineer could predict that the gear would fail in service. The gears then were endurance tested and examined with the result seen at the left where "A" shows clearly the area of incipient failure at precisely the point predicted in advance by Stresscoat analysis. In such cases the remedy has been found in tapering the teeth at the extreme ends and by increasing the radius of the edge.

Fig. 4 is an excellent example of a "before" and "after" design of an aluminum cambox for an airplane engine. The two views at the left are of the top and the inside of the casting as originally designed with strengthening ribs ostensibly to provide greater rigidity and resistance to fatigue. Actually when the casting was tested, serious stress concentration was found in the ribs. By proper interpretation of these indications, it was reasoned that the design of the part could be improved by removing all ribs, inside and out, and by a redistribution of metal to provide more generous corner radii and blending around bosses. The resulting design may be seen in the two views at the right. Note the absence of ribs as well as the change in contour inside and out. The new design showed freedom from stress concentrations and an increase of 125 per cent in strength. In this instance both weight and rigidity remained unchanged.

It may sound paradoxical but there are cases where the judicious removal of metal serves to enhance physical properties. An excellent example of this may be seen in Fig. 5. Here is an aircraft engine crankshaft journal which, initially, had the form shown in the upper left hand view. The cross-section shows the shoulder and small radius at the junction of the journal and web, the relatively thick diagonal section through the lower end of the web, and the shallow depth of the hole through the journal. Stress analysis indicated that the stress in the fillet at "A" was of the order of 30,000 psi.

The crankshaft then was remachined as at the right, metal being removed at several points as shown by the dotted lines in the cross-section. It will be noted that the lightening hole runs in considerably deeper and some metal is removed from the opposite side of the web. In addition, the journal was blended into the web with a fillet of generous radius. The stress pattern now is considerably smaller but more important, the stress at "B" is only 15,200 psi, to all intents just half that in the original shaft. Actually shaft strength was increased some 98 per cent.

For another significant study consider Fig. 6 showing an improvement in the form of a blade rod. The original design at the left showed serious stress concentration at "A" where the boss was machined to provide clearance for the bolt head. In addition, stress concentration was induced in the side of the rod immediately above.

The remedy is apparent in the view at the right. Metal was removed from the side of the rod, permitting the blending of the side directly into bolt boss. This change not only relieved the highly stressed area at the bolt head, but also produced a more uniform pattern of stress in the sides and web.

Crankcase structure has been the subject of considerable development. One recent "before" and "after" case history is illustrated in Figs. 7 and 8, respectively. In Fig. 7 we have the original aluminum crankcase deeply ribbed at the diaphragms and bosses to provide rigidity. Analysis similar to that described

(Turn to page 100, please)



Atomic Energy Aircraft

The Army Air Forces' contract with Fairchild Engine and Airplane Corp. for fundamental research into the problem of atomic energy propulsion for aircraft is the first evidence of official belief in the practicality of atomic energy for commercial purposes. However, it is believed that the immediate goal of the investigation is to provide propulsion for pilotless missiles, which do not require the heavy lead shielding necessary to protect humans from the radioactive particles.

Carrier Jet Planes

The first successful operation of a jet-propelled Navy fighter plane from the deck of a carrier at sea was accomplished with the McDonnell XFD-1 Phantom from the deck of the U.S.S. Franklin D. Roosevelt. The five-ton fighter, powered by two Westinghouse 19-B axial-flow turbo-jet engines, made five takeoffs and landings without in-Lt. Comdr. James Davidson piloted the Phantom and demonstrated that a jet fighter can take a "wave off" successfully, this having been one of the primary criticisms of the usefulness of jet planes from carriers. Production contracts for about 50 planes are now in progress at McDonnell Aircraft Corp., St. Louis, Mo. Air Briefs reporter witnessed the flights, which took place about 35 miles off the Virginia Capes. The Phantom took off after a run of less than 400 ft into a 35 knot wind.

Pressure Chambers

Both North American Aviation, Inc., and Chance Vought Division, United Aircraft Corp. now have altitude pressure chambers in operation to provide the low pressure and temperature conditions prevailing at 40,000 ft and above. North American's chamber is 17 ft in diameter and 53 ft long. It is insulated by nine inches of cork. Temperatures can be varied from —96 F to 185 F. Complete fighter or

bomber fuselages can be installed in the chamber, which is remotely-controlled. The Vought chamber is a dual, vertical type with the lower portion housing the test items and the upper portion containing the cooling coils and blowers.

Cosmic Ray Research

Because the AAF has discovered that cosmic ray activity at altitudes above 40,000 ft seriously affect electrical instruments and radio communications, an extensive program of investigation utilizing a Boeing B-29 Superfortress "flying laboratory" on highaltitude, long-range flights throughout the Western Hemisphere is now well advanced. The flights are being conducted jointly by the AAF and the National Geographic Society to determine—the effect of mesatron showers on microwave transmission, the effect of cosmic rays on materials used in guided missiles and the energy spectrum of cosmic radiations.

Helicopter Mail

Post Office Department officials are convinced that helicopter delivery of air mail from the airport to the downtown post office will be practical this Plans have already been approved for regular operations in Los Angeles, Detroit, Chicago, New York, Boston and Philadelphia, beginning late this year or early 1947. Recent tests at Los Angeles by the Post Office Department in conjunction with Army Air Forces, which provided pilots, crews and helicopters, proved the practicality of the idea, which would result in time-savings of as much as one whole day in the receipt of airmail.

Transport Helicopter

Kellett Aviation Corp. is developing the first twin-engine helicopter, the model KH-2, which is designed to carry 10 passengers or a ton of cargo. Although other designs have used twin rotors, this is the first twin engine de-

sign announced. It will be powered by two Continental 550 hp engines.

Nylon Fuel Janks

Boeing Airplane Co. is using nylon fuel tanks in their new Stratocruiser transport. The tanks are fabricated from 0.020 in, nylon cloth covered by two-ply glass cloth to prevent nylon abrasion. The new tanks will save 3700 lbs over former tanks. The new tanks can be refueled in 10 minutes.

Allison Production

Allison Engineering Division, General Motors Corp., now claims to be the largest aircraft engine producer in the nation. Now utilizing all of its wartime facilities, including the two million square feet Maywood plant, and expanding towards an employe total of 6000, Allison is in volume production on J-33 turbojet engines for Lockheed P-80 Shooting Star jet planes and V-1710 reciprocating engines for the North American P-82 night fighter. A total of nine million horsepower will be delivered during 1947, largest in the world.

Supersonic Tests

Because wind tunnels "choke" when the speed of sound is reached (due to shock wave formation across their test section), they offer little usefulness for test work at transsonic speeds. To provide data at these speeds, rockets with small airfoil test sections attached to their nose, are being fired by California Institute of Technology under contracts with the Army and Navy. Data on lift, drag and moment characteristics are relayed to ground observers by telemeter equipment while the rocket is in flight. There are no limitations to flight speeds of these rockets, which are known as RAFT (Rocket Air Foil Tester) types.

Boundary Layer

Douglas Aircraft Co. now has plans for a series of giant airliners which utilize "boundary layer control" to achieve speeds as high as 500 mph. The boundary layer is a tiny coat of "dead air" which clings to the surface of airplanes in flight and which produces most of the parasite drag that must be overcome by the engines. Douglas proposes to "suck away" this boundary layer through a series of tiny slots on the wings and fuselage, thereby eliminating this source of drag and

(Turn to page 58, please)

New Production and Plant Equipment

A NEW type of fire-extinguishing unit designed to furnish effective fire protection for a wide range of outdoor industrial fire hazards has been introduced by Cardox Corp., 307 N. Michigan Ave., Chicago 1, Ill.

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The new unit has a capacity of 750 lb of low pressure liquid carbon dioxide and 32 gal of mechanical foam solution. Its two long range carbon dioxide nozzles, each with 100 ft of %-in. hose, have a combined discharge rate of 400 lb of carbon dioxide per minute. A foam gun, on a 100-ft, %-in. hose line has a discharge rate of 18 gpm, with pressure supplied by the carbon dioxide. The two extinguishing agents supplement one another.

The unit is a four-wheel trailer, using standard automobile wheels and front axle assembly and 6:00 x 16 tires. It has a wheelbase of 52 in., front and rear tread widths of 58 and 60 in., respectively, and an overall height of 5 ft 4 in. A standard automotive towing bar provides connection to automobile, jeep or tractor. Step plates on sides



Cardox fire-extinguishing unit

and rear accommodate three firemen, each of whom mans a hose line.

Low pressure liquid carbon dioxide is stored in the trailer in a single insulated, refrigerated pressure vessel at a controlled temperature of approximately 0 F. and 300 psi. At this temperature the liquid carbon dioxide yields 47 per cent CO₂ "snow" (finely divided particles of dry ice) when released.

A NEW air-powered peening and scaling hammer, Model 7002, is announced by the Aro Equipment Corporation, Bryan, Ohio. This hammer is particularly adapted to the removal of scale and rust from welded parts. It can also be used for removing sand from small castings and for peening

tubular rivets and other small parts.

This tool delivers 5000 blows per minute, yet will not distort light sheet metal when removing scale. Piston and cylinder are of alloy steel, precision ground. Overall length of the hammer head is 2½ in. and the tool is



Model 7002 Aro peening and scaling hammer

7 in. in length. It is small enough to get in the hard-to-reach places. The connection between the hammer head and body can be any desired length. Body of the tool is cast aluminum with automatic throttle valve.

One of the latest developments of the Bullard Co., 286 Canfield Ave., Bridgeport, Conn., is the Man-Au-Trol Spacer, a hydraulically-actuated mech-

anism for precision drilling, tapping, reaming and boring of holes in metal parts without the use of jigs.

The Spacer consists of a heavy flat table, which moves either laterally or longitudinally on its base under an accurate drill spindle rigidly fixed in one position. With the work clamped in place, the table is hydraulically traversed from one pre-determined position to another by means of two selector controls—one for lateral positions, the other for locating longitudinal positions.

Settings are rapidly and easily made by the adjustment of screws controlling the multiple longitudinal and cross positions of the table, and when once set the platen will constantly repeat to its pre-arranged settings. Shifting the table from one position to the next is readily accomplished by rotating two handwheels to the dial readings corresponding to that setting for the table. These handwheels control respectively the lengthwise and crosswise motions of the table.

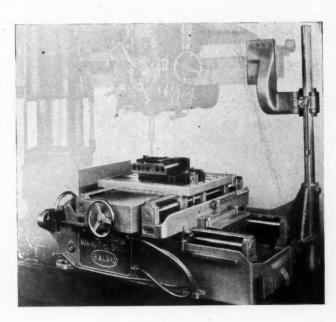
There is one hydraulic cylinder for each longitudinal and transverse motion. Thus, if 10 cylinders were provided for each of the two directions, there would be 100 positions available. Force from a balanced master cylinder, working in conjunction with the force of any active cylinder, provides a rapid but smooth motion from one location to another and locks the table against its stop.

Hydraulic power to operate the Spacer is provided by a self-contained pump operated by a constant speed motor which is the only electrical equipment required.

The Man-Au-Trol Spacer may be applied to various types of drilling machines. It will be made in a variety of sizes, from one with a work-carrying table measuring several inches square to others capable of handling massive work.

(Turn to next page, please)





DESIGNED for laminating and polishing plastic sheets and curing rubber products, a multiple-opening platen press is being made by R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

The side slabs are locked to the top platen and cylinder casting by means of keyed joints and bolts, while steel tie rods, shrunk into position at assembly, provide a rigid, compact unit. Platens, which can be either steam or electrically heated, measure 30 in. by 30 in. by 2 in.

Machined guide blocks, bolted to the moving press platen, slide on vertical guides attached to the inner face of each side slab, thus guiding the platen over the full stroke of the press. The intermediate platens are guided at each corner on steel guide strips and are spaced, by step type hangers, with 4 in. of daylight between them when the press is open. Provision is made for spacing the platens with 2½ in. of daylight when required.

Capable of pressures up to 1500 psi, the press can be furnished with or without elevators, and in other sizes and capacities to suit requirements.

SEVERAL new features are incorporated in the Di-Arco brake No. 4, made by O'Neil-Irwin Manufacturing Co., 317 Eighth Ave., Minneapolis, Minn. A double-edge vertical folding plate allows close reverse bends to be formed. Special material clamping action makes possible extremely sharp

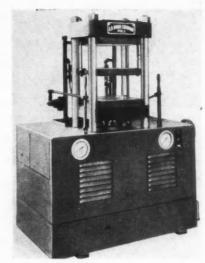


Di-Acro brake No. 4

bends. Roller bearings increase speed and ease of operation. A quickly-adjustable material gage assures precision in duplicated parts.

The new brake has a material capacity of 16-ga sheet metal, and a forming width of 24 in. Its weight is 285 lb.

L ANDIS MACHINE CO., 5th and Church Sts., Waynesboro, Pa., has designed and built an automatic nipple machine which threads, reams and chamfers both ends of space nipples. Built in two sizes; the 1½-in. model handles ½, ¾ or 1-in. pipe sizes, while the 2-in.



Wood 285-ton multiple-opening platen press

model handles 1, 11/4, 11/2 or 2-in. pipe sizes.

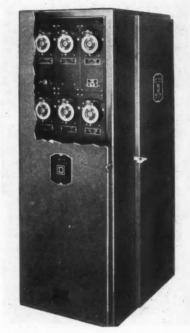
This Landis automatic nipple machine has two spindles, each equipped with an internal trip, semi-receding pipe and nipple threading die head and reaming attachments. The two carriages have air-operated vises for gripping the nipples, and the left hand carriage carries an adjustable magazine from which the nipple blanks are automatically fed into the machine.

The machines are driven by a constant-speed motor through a safety clutch. Change gears are provided to give the required spindle speeds for the pipe size to be threaded.

FULLY automatic control of air-operated resistance welding machines is provided in the class 8992 combination control unit designed by the Square D Co., 4041 N. Richards St., Milwaukee 12, Wis., to meet recently adopted NEMA standards for resistance welder control.

A Syncro-Break welder contractor

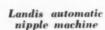
and Safront sequence-weld timer are both included in a single enclosure arranged to mount on the right-hand side of the machine with all control elements within easy reach of the operator. Contactor and timer interwiring is provided, and fuse protection of all control circuits is included. A metal barrier between contactor and timer sections of the enclosure eliminates any possibility of flash-over between the power and control circuits. Foot switch, pressure switch, no-weld switch and timer control circuits operate at 110 volts and are isolated from the

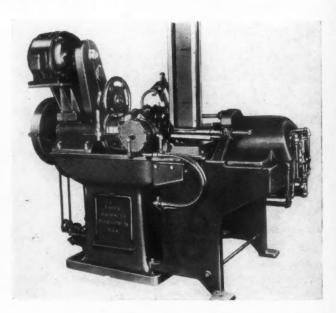


The Square D combination welder

power supply to give the operator

Combination controllers are designed (Turn to page 104, please)





X-raying a Jeep



(Top) Ready to be X-rayed, the Jeep is in position on blocks with Kodak industrial X-ray film in four light-tight envelopes bound together to complete film background.

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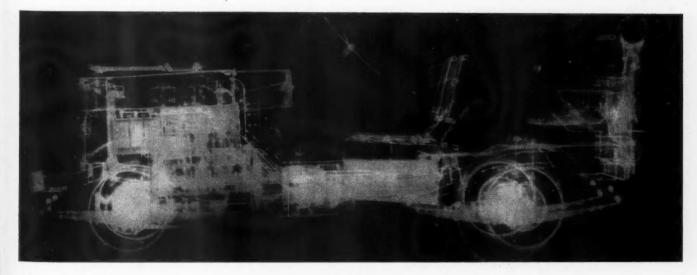
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TRIES

(Right) Million-volt X-ray unit directed at Jeep 60 ft. away. The door of the laboratory was closed during the 90-min. exposure and no lead screens were used to reduce contrast. The film was processed in five min.

(Below) While this huge radiograph has no direct significance to automotive engineers, it does indicate the potentialities of radiographic development and quality control of alloy castings.





August 15, 1946

New Products. for Aircraft

New Hydraulic Device

Electrol Inc., 85 Grand St., Kingston, N.Y., is now in production on a new hydraulic device known as the Powerpak, which combines in one compact unit a hand pump, two separate fourway selector valves, relief valve and

Electrol Powerpak

reservoir. Ports for connecting pressure and suction lines of a power-driven pump are provided when such an installation is desired. When a power-driven pump is employed, the hand pump can be for auxiliary use.

The Powerpak has standard parts throughout, and weighs five lb. The design conforms to Army, Navy and commercial standards. Exclusive of the handle, the Powerpak stands 4½ in. high, and its base measures 3½ by four in.

Operating pressures up to 1500 psi can be supplied. Low pressure drops are assured by means of large orifices through which the flow passes. The reservoir capacity, 12 cu in. on the model illustrated, can be increased to accommodate individual requirements. Flow from the hand pump is % cu in. per cycle and the flow from an engine pump may be up to 1½ gpm.

In the airplane installation, the valve lever on the left of the housing is pushed forward to lower the flaps, and these may be positioned at any angle

by the amount of fluid supplied by the pump. An instrument board indicator reveals the flap setting at all times. The lever controlling the undercarriage also is pushed forward to lower the gear. A slight pull on the knob releases a locking pin each time this lever is moved forward or backward.

Combination Test Stand for Hydraulic Propellers

A combination propeller hub and regulator test rig designed for checking Aeroproducts propeller Models A 642-G1 and A 642-G2 is announced by Hydraulic Machinery Inc., 12825 Ford Rd., Dearborn, Mich., and is identified as Model T-133. The function of this combination test stand is to test the hydraulic functions of variable pitch propellers.

The propeller hub is mounted on a semi-steel surface plate and is so designed that the propeller blades can be rotated while under pressure for the full 360 deg for checking propeller track. This surface plate has scribed markings for checking blade angle at the stations indicated by the manufacturer. Also the construction of this stand permits its use as an assembly bench.

The test rig is comprised of a welded steel base with two oil reservoirs welded into the base as an integral unit. Mounted on the base with adjustable leveling screws is a semi-steel surface plate. The hub test head or hub mounting adapter plate is located on the front end of this surface plate in a machined well. The regulator drive shaft and rotary seal gland are mounted on standard pillow blocks on the underside of the surface plate at the

front end of the rig. The regulator drive shaft is driven by "V" belts through a fixed stroke piston type fluid motor which is piped to a variable delivery piston type pump driven by a 10 hp electric motor. The pump is manually controlled by a handwheel at the operator's station. This hydraulic drive permits infinitely variable speeds from 0 to 2000 rpm. The instrument panel, control valves and regulator rpm control are located on the right side at the front of the rig. The regulator is mounted inside of the rig at the front end. A safety gate is provided for the regulator mounting.

New Synthetic Grease for Aircraft Lubrication

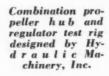
A new synthetic, low-temperature grease has been developed by The Texas Co., New York, N. Y., which demonstrates a wider range of operating temperatures than any other of its aircraft lubricants. This grease is to be known as Texaco Uni-Temp grease. It is a lithium-base grease in which a synthetic compound is employed as the oily constituent, is light tan in color, and has a buttery texture. It is also put out in a form containing rust inhibitors for use where excessive moisture or salt sprays may be encountered.

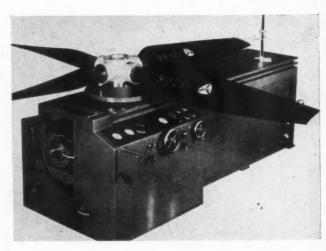
Uni-Temp grease has been approved under the requirements of the AN-G-25 specification. This one product matches the performance of the four Texaco aircraft greases previously required in the application temperature range of -100F to 300F. The grease is claimed to maintain its fundamental lubricating characteristics at any temperature likely to be found on the ground or at any altitude in aircraft.

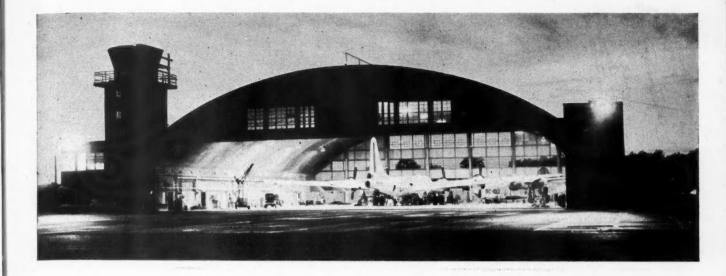
Summer Coating for Aircraft De-Icers

A "spray-on" treatment for giving aircraft De-Icers a protective summer coating, easily peeled off when icing weather returns, has been developed by the B. F. Goodrich Co., Akron, Ohio, and is being further tested, according to the Company.

(Turn to page 62, please)









At General Electric's newly-completed Flight Test Center, which is shown in this photo, Army-loaned warplanes are converted into flying laboratories for flight testing new aircraft developments. The Center includes the large hangar for experimental aircraft, two floors of laboratories, workshops, engineering offices, and a control tower for various types of radio equipment.

G-E Flight Test Center

(Above) For testing a G-E jet engine in flight, suspended underneath the bomb bay doors of a B-29 Superfortress, this automatic temperature recorder and other instruments are installed in the plane for taking test readings.

(Right) A special scoop atop a B-24 Liberator which has been converted into a flying laboratory. It feeds air to a jet engine inside the fuselage.



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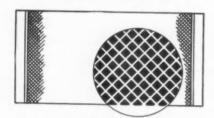
RIES

Mew Products

Mallory Brings Out Line of Grid Bearings

A line of grid bearings, said to combine good surface properties and good embeddability with high strength and fatigue resistance, is now in production at P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind. Based on the principle that makes graphite impregnated bushings so useful in marginal lubrication, these bearings are constructed as grids. By indenting the surface of one material and filling it with another, the good surface qualities of soft bearing alloys are combined with the strength of harder metals.

Silver or copper is used as the base metal on these new steel backed bearings. The steel backing material is in the range of .08-.30 carbon. Between 20 and 50 indentations per in. are knurled into the base metal to a minimum depth of .008 in. A lead alloy containing 5-10 per cent tin is used as a filler and covers at least 40 per cent of the bearing area. The base metal is thermal bonded or electroplated to the

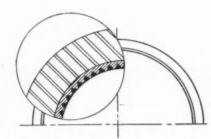


Enlarged view of surface of Mallory grid bearing after final machining

steel back, and the filler lead is electroplated or cast into the knurled base metal. After machining operations are completed the depth of filler over the points of the base metal does not exceed .0005 in. Final machining is held concentric with the knurling operation.

Being combinations of materials notably resistant to corrosion, these bearings are claimed to be equal to any other bearing material in this regard while their grid construction seems to give them the ability to heal themselves after partial seizure at any point below maximum load. In regard to the property of embeddability, grid type bearings seems almost the equal of lead base babbitt with the added advantage of high resistance to deformation from embedded dirt.

Recommended for all shaft materials



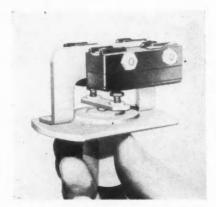
Enlarged view of section of Mallory grid bearing after final machining

of over 200 Brinnel hardness, the new grid bearings should be particularly useful in very heavily loaded applications (approximately 4,000-7,000 psi) and in normal heavy duty applications (approximately 1,000-4,000 psi).

Pressure and Vacuum Actuated Electric Switches

Cook Electric Co., 2700 Southport Ave., Chicago, Ill., is now marketing a standard line of pressure and vacuum actuated electric switches. The switches will respond to pressures from either liquids or gases, as the working element is a diaphragm-type bellows constructed of tinned phosphor-bronze. When acted upon by a pressure, the bellows either opens or closes a 6 to 10-amp capacity electrical switch. Three models are now in production.

Model "LP" is designed to operate at very low pressures and is suitable for controlling low-pressure blower systems and vacuum filling operations as a water level control, for aircraft application such as air speed indication and oil level control and wherever small differences in pressures must be detected. It operates at pressures from



Cook Model ID pressure switch

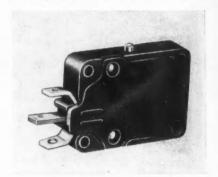
0 to 30 in. of water, or vacuum, or both. The pressure difference between "on" and "off" position of the switch contacts may be adjusted between 0.3 in. and 10 in. of water pressure. When calibrated to position this switch may be mounted vertically, horizontally or upside down.

Model "ID" operates at pressures from 1 to 17 psi. It is equipped with two electric switches and can be adjusted to open or close at equal or different pressures, and is used wherever two circuits need independent control. For example, on electric steam heaters where circuit "A" controls the circulating fan while circuit "B" controls the heating element. The pressure difference between on and off position of the switches may be adjusted separately between 1 and 10 psi. The company will supply these switches to operate at pressures up to 200 psi.

Model "SD" is the equal of model "ID" except that it has only one electrical switch. It is used to control the pressure of steam boilers and to monitor other heating elements.

Miniature Electric Switch

A new Model "M" rolling spring, snap-action electric switch is now in production by the Acro Electric Co., 1314 Superior Ave., Cleveland 14, Ohio.



Acro Model "M" miniature switch

It is made for single and multiple assemblies. Four of these switches can be mounted in a space of less than 1% in. The switch is available with single pole, single or double throw contacts and is rated at ten amp, 125 volt alternating current.

The molded case is designed for greater strength by means of a fully recessed cover which is inserted clear of the four, 3/32-in. mounting holes. The size of the barriers between the terminals has been increased. To make wiring easier, heavier solder terminals are used with 0.082-in. terminal holes. The switch illustrated can be fitted with various types of actuators.

Panel-Type Tachometer

Ideal Industries, Inc., 3000 Park Ave., Sycamore, Ill., is introducing an electric tachometer for permanent installation. This unit is designed for use where the pick-up unit, or gen-

(Turn to page 78, please)



THE HIGH STRENGTH, LOW ALLOY STEEL OF MANY USES

Many manufacturers are profiting by the advantages of Inland Hi-Steel* in product performance and manufacturing procedures.

Compare its yield point of 52,500 PSI and tensile strength of 70,000 PSI with any standard steels you are now using. This added strength means that your product can be made stronger with the same cross section, or equally as strong with a smaller cross-section of Hi-Steel.

Long life under abrasive action and corrosive conditions are also features of products made with Inland Hi-Steel. It has been used successfully in the manufacture of Railroad, Construction, Automotive, Material Handling, Mining and Farm Equipment,

Bridges, Storage Tanks, Bins, etc.

You will find Hi-Steel a ductile, low-alloy steel offering properties for fast and economical fabrication. Strong welds may be made with gas, arc, or resistance welding equipment. Machining and forming can be done with little or no changes in speeds, feeds and power used with ordinary carbon steels.

Hi-Steel is produced in plates, bars, structural shapes and hot or cold rolled sheet and strip.

At present, the demand for Hi-Steel exceeds tonnage being produced. We are, however, doing everything in our power to increase this production to meet industries' increased demand.

*Reg. U. S. Pat. Off.

HELP! MORE SCRAP NEEDED!

Extra tons of scrap are needed to make the extra tons of steel for American industry. Please keep your scrap moving back to the mills.



Inland Steel Company, 38 South Dearborn Street, Chicago 3, Illinois. Sales Offices:
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STRIES

Observations BY JOSEPH GESCHELIN

Atomic Energy

ROM the moment the world learned about the destruction caused by the atomic bomb, speculation has been rife concerning the harnessing of atomic energy to do useful work. Some people even went so far as to predict that atomic "engines" of some kind would displace conventional powerplants for passenger cars and trucks. What do the experts think of this? Consider the analysis made by Leonard L. Katzin in an article-"Industry and Atomic Energy" published in Army Ordnance, May-June, 1946. He points cut that power will be generated by the uranium pile which requires two heavy accessories-an efficient forced draft cooling system; and an enormous shield to protect against intense beta, gamma, and X-Ray radiation as well as escaping neutrons. He estimates that even for the most compact of piles the shield may weigh as much as 50 tons. Mr. Katzin concludes that atomic energy cannot be considered as a source of power for any purpose except large stationary power plant installations. Unless scientific research in the next five or ten years upsets the present prospect-and that possibility should not be overlooked-we shall have to depend on the more conventional powerplants for transportation equipment.

Windshield Wipers

TALTHOUGH the windshield wiper is one of the most important items of safety equipment on modern motor cars and other vehicles, it has been considered a relatively minor piece of gadgetry by the users. It is simply amazing to find the wealth of research and engineering effort that has gone into its development over a period of some twenty years. We were given a demonstration recently that was an eye-opener. Arms and blades for 1948 models represent the greatest advance in design and simplification and owner satisfaction, judging by the samples we have seen. One of the most distinctive developments is the special Chinese bridge type blade designed for curved glass. It stems from the work done during the war in making wipers for military airplane blisters. The job we saw not only conforms to simple curved surfaces but is said to be equally satisfactory on warped surfaces combining convex and concave areas.

Broaching Progress

WE HAVE spent some time on our travels with members of the Broaching Tool Institute. Here is a wide awake group of manufacturers producing broaching tools of every description with a realization that the best way to further their business is to further an understanding of the art and to develop a standardization of tools in the interest of the users. The BTI is developing standards and technical literature and through its association office is prepared to assist users in the solution of their problems.

Hard Hobbing

UST as a matter of interest-considering the widespread use of cemented-carbide tools-your attention is drawn to an experimental project sponsored by the Navy during the war. The problem was the hobbing of enormous gears—as automotive sizes go-for turbine reduction drives. The scene was at the Joshua Hendy Iron Works where the gears were being hobbed on huge Gould & Eberhardt hobbers. Although conventional practice was doing well at the job, the Navy was desperately in need of higher output and also insisted upon greater surface hardness. This led to an extensive experimental project in which some of the hobbers were suitably modified for higher operating speeds and greater rigidity and were fitted with special hobs containing inserted teeth tipped with cemented carbide. The project paid off well. Output was stepped up, of course. But more gratifying was the fact that it was possible to hob gears having higher hardness characteristics.

By Induction

HE exploitation of the induction heating techniques during the war has resulted in the availability of many makes and types

of equipment from which a selection can be made to meet specific applications. Such equipment is invaluable in heating parts prior to forging, for brazing and soldering, and for the selective hardening of both inside and outside surfaces.

Third Dimension

In the past we have talked at some length about the need for closer cooperation between engineering and production departments. Today that is imperative if an organization is to take full advantage of new methods and the advanced types of machine tools now being made available to industry. R. E. Bingman, industrial designer, has added a third dimension. He proposes that the team should include the industrial designer. And that is worth thinking about.

Salvaged 10,000 Coil Springs

A SPRING manufacturer recently was faced by the fact that a lot of 10,000 coil springs exceeded compression specifications by one-half to one pound each. Ordinarily that would mean the scrap pile. But in this instance the manufacturer subjected the springs to a few minutes exposure in a Wheelabrator and found that surface tension was relieved sufficiently to salvage the entire lot.

Curved Glass for the Front

Body engineers are doing a lot of work on the application of curved glass to the windshields of motor cars. In fact, it is said that one of the prominent glass producers is building a new plant for the purpose. If and when curved glass comes in, the body men will require the best type of curved glass windshield wipers that can be built. Needless to say, there is considerable development in that direction, also.

Speeding Up Crank Production

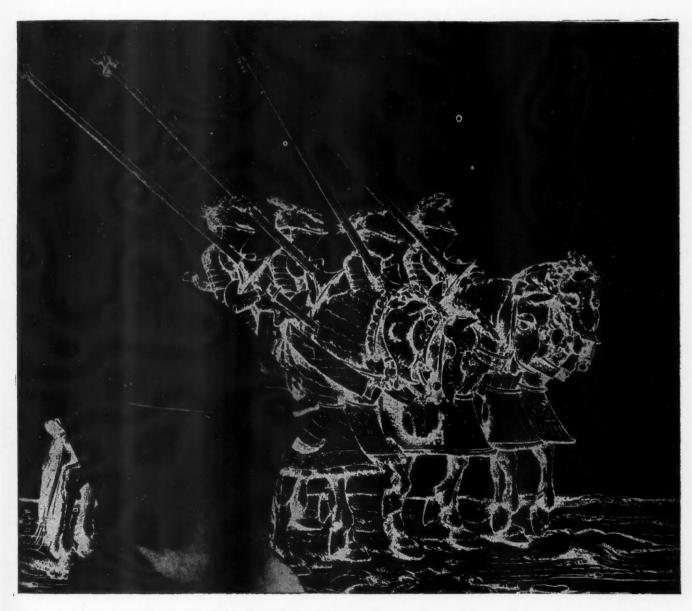
OUTPUT and quality of crankshafts will be greatly enhanced by the use of modern crankshaft turning equipment such as the new Le Blond center drive lathes recently installed in several large motor car plants. Nosing about the industry we saw an automatic lathe with a drum type fixture designed to handle four large crankshafts at a time. We are not free to give more detail but the development certainly is worth noting.

MATERIALS MAKE PERFORMANCE

Several centuries ago the Chevalier de Roye swept the tournaments until a broken saddle girth made him non-operational. A promising career was ruined by a material weakness missed by routine inspection.

Temper brittleness in steel is a modern material

weakness that is easily overlooked, and likely to be fatal to product performance and sales. The adoption of temper-brittle-free molybdenum steels will eliminate this risk... and they will do the job well and economically.



MOLYBDIC OXIDE—BRIQUETTED OR CANNED . FERROMOLYBDENUM . "CALCIUM MOLYBDATE" CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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August 15, 1946

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NEWS Industry

While automotive production hit a postwar peak of roughly 226,000 cars and 93,000 trucks in July, the chances of continuing the rate of increase registered over June are very doubtful. Some observers have predicted that the industry will turn out about 280,000 cars and 120,000 trucks, but the showing made during the last week of July and the first week of August does not lend much encouragement. During the former period, the manufacturers were able to increase production about 6,000 units, but the following week dropped back about that many. In general, the outlook for making any appreciable gains during the fourth quarter of this year is not very good, judging by information contained in letters sent to the UAW-CIO by several manufacturers in rejecting an invitation to attend a conference aimed at ironing out production difficulties. (See story, page 17.)

The general outlook for August was dimmed somewhat at the outset of the month when both Hudson and Studebaker were forced to close down because of a strike at the Dura plant in Toledo, which supplies regulators and door parts. As a result, production for the week ending August 3rd dropped more than 6,000 units for a total of 78,190. This was the second shutdown for Studebaker in a period of two weeks and demonstrates that the danger of strikes in important supplying plants is not past. In fact, General Motors reported in late July that the number of suppliers on strike had increa d slightly to a total of 60.

Ford at the same time had 24. The fact that both Hudson and Studebaker closed practically on the heels of the Dura strike shows how the car builders are living from hand to mouth on supplies, with no chance to build inventories. As a result, a stoppage in the plant of a major supplier immediately assumes crisis proportions. Ford also was in a precarious position early in the month because of strikes among suppliers and faced a shutdown within a few days if strikes at key supplier plants were not settled.

Labor and Materials Still Are Problem

While supplier strikes continue to harass production, they are only one of many troubles militating against capacity production. Also of importance are the shortages of certain critical materials and the growing lack of manpower. Pig iron has assumed an important position in the category of Rate of Production Increase Not Expected to Continue . . . Supplier Strikes Only Part of Producer's Troubles . . . Operations During First Half of 1946 Unprofitable for Manufacturers . . . Chevrolet to Build Two Plants for Light Car Manufacture . . . New Car Registrations at 16 Per Cent of 1941 Rate . . . Liberalization of Credit Rules Recommended.

shortages currently holding assembly lines in low gear.

Not only is production of pig iron down, but the diversion of a large proportion of the available supply to the housing industry has made matters worse. Some automotive foundries are reported to be down to a few days' supply. A survey of 1100 foundries a few weeks ago revealed that soil pipe production is up as much as 72 per cent in some cases, whereas some types of castings have fallen off as much as 51 per cent.

Other items that are causing trouble are nuts and bolts, copper for radiators and electrical equipment, lead, seat and back springs, and certain types of steel. While there is hope for some improvement in the supply of these items over the next few weeks, there is little optimism over the prospects of adequate inventories for a long time.

It now is becoming increasingly evident that manpower is going to be an important consideration if and when production on a large scale is possible. Although unemployment rolls in Detroit list several thousand persons, automobile companies report difficulty in obtaining help.

The shortage is particularly pronounced among the skilled classifications and among the heavy and more undesirable jobs. Some companies are turning to women employees again after greatly reducing the percentage of female help after the war.

Second Quarter Reports Show Operating Losses

Operations during the first half of 1946 were anything but profitable for automobile manufacturers. However, if it had not been for tax carryback

provisions in the Federal tax laws, the results might have bordered on the disastrous for many companies. General Motors reports that for the first half of this year, the corporation suffered an operating loss of \$101 million, which was reduced by tax credits to a net loss of \$19.8 million.

However, it should be noted that the heaviest blow was taken during the first quarter when the company was strike bound and that in the second quarter, while an operating loss of \$12.1 million was incurred, tax adjustments permitted a profit of \$16.3 million. Consequently with production rising, it would seem likely that the next quarter could see G.M. reach the breakeven point at least.

Studebaker Corp., on the other hand, suffered a net loss during the second quarter despite a tax carryback. Operating loss is set at \$5,053,040, which was reduced by the tax adjustment to a net loss of about \$171,000. Studebaker was closed part of the quarter for model changeover and also suffered from strikes in supplier plants.

CPA Approves Building of Chevrolet Light Car Plants

The Civilian Production Administration has registered formal approval of an application by General Motors to build two new plants in the Cleveland area for the Light Car Division of Chevrolet. Estimated cost of the project is more than \$15 million, making it the largest which has been approved since restrictions on non-housing construction were invoked last March.

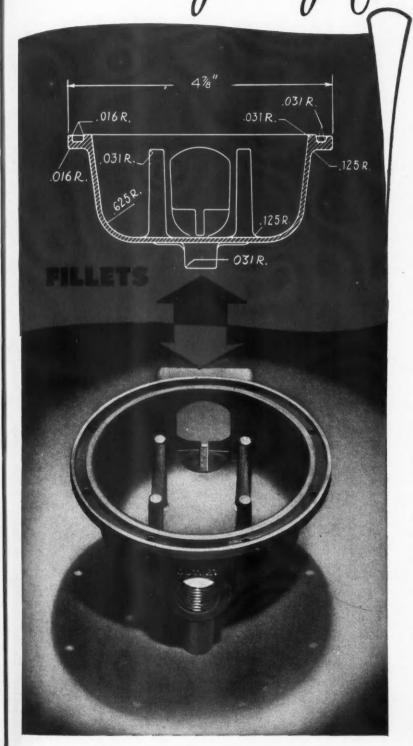
The two plants will have floor space of approximately 2.5 million sq ft and will require about \$50 million worth of machinery and equipment. Completion of the plants and start of production are not expected until late in 1947. The entire manufacturing and assembly of the new light car will be concentrated in the Cleveland plants, according to reports.

New Car Registrations are at One-Sixth of 1941 Rate

Reflecting the low volume of manufacturing in the automobile industry, registrations of new passenger cars for the first half of 1946 were only 16 per cent of the total for the like period in 1941 in the eight states covered, according to R. L. Polk & Co. New cars registered this year totalled only 20,384 compared with 122,656 in 1941.

Truck registrations, however, show (Turn to page 74, please)

Designing for DIE CASTING





In designing die castings, remember that the use of fillets to avoid sharp corners is desirable for a number of reasons. Fillets will:

- 1. Provide greater strength (even the smallest fillets have an appreciable strengthening effect).
- 2. Improve the flow of metal in the die, which is likely to result in smoother surfaces on castings.
- 3. Provide a gradual transition from thick to thin sections.
- 4. Facilitate die construction and ejection of castings from the die.

A radius of .015" minimum is suggested in place of sharp corners and larger radii are desirable when conditions permit. Fillets of .015" radius are barely noticeable even on outside edges and, in fact, a .030" radius is seldom evident except on close inspection. The zinc alloy die casting shown here—a governor body—has been designed with liberal fillets both inside and out, as indicated on the drawing.

Additional data on fillets and other design considerations will be found in our booklet "Designing For Die Casting". To insure that you will get the most from your die casting dollar, ask us—or your die casting source—for a free copy of this booklet.



ZINC
FOR DIE CASTING ALLOYS

THE NEW JERSEY ZINC COMPANY, 160 Front St., New York 7, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on

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RIES

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of Automotive and Aviation Industries. In making requests give title above the item concerning the publication desired, the date of issue in which it appeared, your name and address, company connection and title.

Suntac Oils

Sun Oil Co.—Case bistories of Suntac Oils in industry are given in an illustrated folder just issued.

Multipresses

The Denison Engineering Co.—Illustrated booklet, describing the various standard Multipresses and accessories. Sections include experience data, giving briefly the history of some specific Multipress applications.

Payroll Taxes

The Research Institute of America, Inc.—Analysis No. 47, How to Reduce Payroll Taxes under Merit Rating. Contains timely recommendations for substantial tax savings under today's laws and business conditions. Available from the Institute, 292 Madison Avenue, New York 17, at \$1 per copy.

Ball Bushings

Thomson Industries, Inc.—Twenty-page booklet describes newly developed ball bushing for linear motions. Its operating principle and operating features are explained and advantages obtained by the use of ball bushings are given. Standard dimensions, installation data and load ratings are included, and special designs of the ball bushing are indicated and fields of application suggested.

Selector for Aluminum Alloys

Reynolds Metal Co.—Technical information concerning 18 of the most widely used aluminum alloys is presented in an easy-to-use Reynolds Aluminum Alloy Selector, a slide-rule type of chart. The chart includes an explanation of alloy and temper designations as well as a brief description of outstanding properties of each of the 18 different alloys. Available from Reynolds Metal Co., Dept. 47, 2500 S. 3rd Street, Louisville 1, Ky. Price, \$1 each.

Test Procedure

Elastic Stop Nut Corp. of America—Sixteen-page booklet, Test Procedure, describes a procedure for testing the locking effectiveness of self-locking nuts and related fastening devices. The booklet was prepared by Dr. J. A. Sauer, Ph.D., head of the department of engineering mechanics, Penna. State College. Equipment and procedure for making tests for vibration, installation and removal torque, reuse torque and wearing and plating are described.

Permanent Mold Process

Eaton Manufacturing Co.—Foundry Div.—Illustrated booklet giving the story of the Permanent Mold Process, the procedure used in preparing the molds from the drawing board through the various stages to the finished and

tested mold. One section covers the Permanent Mold Process of producing Gray Iron Castings and a discussion of the physical and mechanical properties of Permanent Mold Gray Iron together with some suggestions for designing products for the Permanent Mold Gray Iron Process.

Fork Truck

Crescent Truck Co.—Folder describing the new Crescent Electric Pallatier Fork Truck. Included are photographs and diagrams of the Model LHVH truck.

Electrically Heated Rubber

The B. F. Goodrich Co.—Four-page folder on electrically heated rubber in airplane applications describes how it is used on propellers, cowling, air scoops, etc.

Body Engineers to Hold Technical Session

Carl W. Cenzer, general chairman of the Technical Convention being sponsored by the American Society of Body Engineers, Inc., Oct. 23, 24 and 25, 1946, in the Rackham Memorial Bldg., Detroit, has announced the following speakers to present papers on subjects relative to automobile body engineering:

Wednesday, Oct. 23, 1946. Ten A.M. Session—Styling. Chairman, Charles G. Walker, Chrysler Corp., Detroit. Speakers: Avard Fairbanks, Assoc. Professor of Sculpture, Institute of Fine Arts, University of Michigan, Ann Arbor, Mich.; T. C. Hobbs, Ford Motor Co., Dearborn, Mich. Two P.M. Ses-

sion—Production Engineering. Chairman, Rex Terry, asst. chief engineer, Chrysler Corp., Truck Division. Speaker, Louis M. Benkert, sales manager, Progressive Welder Co., Detroit. Subject—"Modern Trend in Body Assembling and Welding." Eight P.M. Session—Open House. Chairman, I. Louis Carron, president, American Society of Body Engineers, Inc., Dura Division of Detroit Harvester Co., Detroit.

Thursday, Oct. 24, 1946. Ten A.M. Session - Commercial Bodies (Chairman and speakers not finally determined) Two P.M. Session-Hydro and Vacuum Mechanisms as Used in Bodies. Chairman, A. O. Koppin, body engineer, Hudson Motor Car Co., Detroit, Speakers: E. C. Horton, chief engineer, Trico Products Co., Buffalo, N. Y. Subject-"Harnessed Air Power, a Byproduct of Internal Combustion Engine Control"; John B. Parsons, chief hydraulic engineer, Dura Division of Detroit Harvester Co., Toledo, Ohio, Subject-"Hydraulic Mechanisms as Used in Auto Bodies." Eight P.M. Session-Passenger Car Engineering. Chairman, E. C. DeSmet, executive engineer, Willys - Overland Motors, Inc., Toledo, Ohio. Speaker, to be determined later, Libby-Owens - Ford. Subject-"The Effect of Windshield Curvature on Safety and Vision."

Friday, Oct. 25, 1946. Ten A.M. Session-Buses and Coaches. Speaker, L. T. Flynn, G.M. Truck and Coach. Subject-"The Serviceman Designs a Coach Body." Two P.M. Session-Choice of Materials in Body Construction. Chairman, John Votypka, chief engineer, Motor State Products Co., Ypsilanti, Mich. Speakers: William K. Norwick, Fisher Body, Detroit; Roy B. Davis, director, Flint Laboratory of E. I. du Pont de-Nemours & Co., Inc. Subject-"Metallichrome Automotive Lacquers;" Games Slayter, vice president, Owens-Corning-Fiberglas Corp., Newark, Ohio. Eight P.M. Session-Truck Bodies. Speaker, Leonard A. Stewart, body engineer, Mack Manufacturing Co., Allentown,

Current Assets and Liabilities of 23 U. S. Aircraft and Equipment Companies, 1939-1945

(Millions of Dollars) 1945 Current Assets Cash on hand and in banks.
U. S. tax and savings notes. 99 259 604 583 258 230 220 Other U. S. Gov't securities.
Other marketable securities
Receivables from U. S. Gov't. 48 5 113 49 574 1087 919 217 58 Other notes and accounts receivable..... 96 513 906 709 396 157 Other current assets 15 11 2597 1711 1174 3010 Total Current Assets..... **Current Liabilities** 25 201 220 780 407 895 403 206 Other trade notes and accounts payable..... 21 131 479 236 491 Federal income taxes accrued..... 37 61 4 29 81 255 86 28 91 Other current liabilities 144 114 110 1099 2574 2175 Total Current Liabilities..... 1005 143 Net Working Capital ... 612 Source: Securities and Exchange Commission.

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FORM-A-GASKET No. 2 (a paste) sets slower than No. 1. It dries to a tough, pliable layer with plenty of "cushion". It resists high pressures, continual vibrations and disassembles very readily.

AVIATION FORM-A-GASKET No. 3 (a brushable, self-leveling liquid) sets into position and dries to a tacky paste. It will not run even when heated to 400° F. . . . nor will it become hard or brittle at temperatures down to 70° F. below zero.

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STRIES

PERSONALS

Recent Personnel Changes and Appointents at the Plants of Automotive and viation Manufacturers and Their Sup-Aviation

Nash-Kelvinator Corp., Nash Motors Div.-B. A. Chapman, Staff Engineer, asst. to Vice-Pres. in Charge of Manufacturing.

Bendix Aviation Corp., Bendix Products Div.-Lyman Burch, Technical Service Manager.

Consolidated Vultee Aircraft Corp .-William A. Blees, Vice-Pres. in charge of Sales has been elected a director.

Ford Motor Co.-George W. Walker.

Design Consultant.

Willys-Overland Motors, Inc.-Joseph M. Brennan, Director of Works Operations in charge of manufacturing and industrial relations. Claude A. Crusoe, Director of Purchasing and director of materials.

Chrysler Corp., Dodge Passenger Car Div .- A. E. Horne, Advertising Man-

ager.

Scripps Motor Co. - Lawrence S.

LeGros, Chief Engineer.

Fairchild Engine and Airplane Corp., Personal Planes Div.-J. P. Donald

Garges, Chief Engineer.

Canadian-Wright Limited (Curtiss-Wright Corp.)-H. V. Wright, President and Director; J. A. Limoges, Vice-Pres. and Treas. and Director. Other newly elected directors are W. D. Kennedy, Norman H. Bell, L. M. Coughtry and L. E. Seaton.

Curtiss-Wright Corp. - Lawrence B. Richardson, Executive Asst. to the President, G. W. Vaughan.

Ellinwood Industries - Bernard L. Bray, Sales Manager of Marine Equipment Div.

Borg-Warner Corp.-Stuart F. Malcolm, Acting Manager of Automotive Section, Borg-Warner International.

Pittsburgh Plate Glass Co., Ditzler Color Div.—V. G. Schwenke, Service Manager.

Perfect Circle Co.-George Rhea, Secretary-Treasurer.

Marmon-Herrington Co.-David M. Klausmeyer, C. Alfred Campbell, Guy C. Dixon and Earl J. Breech, elected

Alloy Rods Co .- P. D. Scott, General Sales Manager.

Colonial Broach Co.-Gus Gran, Asst. Sales Manager, and Ben F. Welte, Asst. Chief Engineer.

Republic Aviation Corp.-Irving R. Kappler, Procurement Director, and William H. H. Curtis, Master Mechanic.

The Colorado Fuel and Iron Corp., Wickwire Spencer Steel Div.-Sidney E. McCrum, Advertising Manager.

General Motors Corp., New Departure Div.-Lester A. Lanning, manager of Sandusky Plant.

Goodyear Tire & Rubber Co.-Earl C. Flinn, Asst. District Mgr., Detroit; J. H. Stephens, Jr., Merchandising

School Instructor. C. B. Chambliss. Field Staff Operating Supervisor of Highway Transportation Div.

Detrex Corp.-Dr. William L. Mc-Cracken, Administrative Asst. to C. F. Dingley, Sr., Vice-Pres. in charge of research and engineering.

Bowser, Inc., Industrial Pump Div.-E. W. Chapman, Chief Engineer.

United States Rubber Co., Synthetic Rubber Div.-Dr. William F. Tuley, Operations Manager.

The White Motor Co., Fred Huber, Export Service Manager for West Indies, Central America and South America except Brazil, Argentina and Uruguay.

Continental Aviation & Engineering Corp., William E. Herby, Chief Engineer.

Timken Roller Bearing Co .- R. E. Wagenhals, Director of Quality Control for all Bearing Divs.

Mid-States Equipment Corp.-Frank V. Lockefer, General Sales Manager.

International Plastic Corp. - A. E. Philips, resigned as Vice-President in Charge of Marketing.

CALENDAR

Conventions and Meetings

Annual Revival Glidden Tour. Albany, N. Y. A. A. Natl. West Coast Trans. Aug. 17-24 SAE Natl. West Coast Tran Maint. Meeting, Seattle National Air Races, Cleveland Aug. 22-24

Aug. 30-Sept. 2 I. Aeronautic Assoc. of Canada, International Air Show, Toronto Aug. 30-Sept. 7

Natl. Chemical Exposition, Chicago Sept. 9-13 American Chemical Soc., Chicago Semi-Sept. 10-14 Annual Mtg. SAE Natl. Tractor Meeting, Milwaukee, Wis. Sept. 1 Natl. Assoc. of Foremen Convention, Sept. 11-12 St. Louis Sept. 12-14

Instrument Society of America, Natl. Show, Pittsburgh Sept. 16-20 SAE Natl. Aeronautic Mtg. & Aircraft
Eng. Display, Los Angeles Oct. 3-5
Natl. Aircraft Show, Cleveland Oct. 4-12
Amer. Society Tool Engineers, Semi-

Annual Convention, Pittsburgh Oct. 10-12 1946 Natl. Aviation Clinic, Oklahoma City Oct. 1
SAE Natl. Transportation and Mainte-Oct. 14-17

nance Meeting, Chicago Oct. 16-17 Amer. Soc. Body Eng. Technical Meeting, Detroit Oct. 23-25 SAE Natl. Fuels & Lubricants Mtg.,

Tulsa Nov. 7-8 French Aero Show, Grand Palais, Paris Nov. American Welding Society Annual

Meeting, Atlantic City Nov. 1
Natl. Metal Congress and Exposition Nov. 17-22 Atlantic City Nov. 18-22

American Assoc. Motor Vehicles Adm.,

Annual Mtg., San Francisco Nov. 18-21 SAE Natl. Air Transport Engineering

Mtg., Chicago
Natl. Standard Parts Assoc.
Atlantic City
Motor & Equip. Wholesalers
Convention, Atlantic City Dec. 2-4 Conv., Dec. 6-7 Assoc. Dec. 6 Automotive Service Industries Show,

Atlantic City Dec. 9-14 Int. Aviation Celebration & Exhibition, Dec. 12-15 El Paso

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for Auto-motive and Aviation Industries

Increasing general business activity has been indicated. The New York Times index for the week ended July 27 stands at 138.1, as compared with the preceding for week and 140.4 a year ago.

Sales of department stores, as reported by the Federal Reserve Board, for the week ended July 27 equaled 202 per cent of the 1935-39 average, as compared with 201 in the preceding week. Sales were 33 per cent above the corresponding distribution in 1945, as against a like advance of 28 per cent for the week before. The total The total in 1946 so far reported is 28 per cent greater than the comparable sum in 1945.

Electric power production was further increased during the week ended July 27. The output was 1.9 per cent below the comparable amount July last year, as compared with a similar recession of 2.1 per cent in the preceding week.

Railway freight loadings during the same week totaled 910,513 cars, 1.2 per cent less than the figure for the week before but 2.7 per cent above the corresponding number a year ago.

Crude oil production in the week ended July 27 averaged 4,926,050 bar-

rels daily, 11,050 barrels less than the average for the preceding week and 3950 barrels below the comparable figure in 1945.

Bituminous coal and lignite production during the week ended July 20 was estimated at 12,350,000 tons, as compared with 12,750,000 tons in the week before and 11,417,000 tons a year ago. The output in 1946 so far reported is 18.9 per cent below the corresponding production in 1945.

Civil engineering construction volume reported for the week ended Aug. 1 by Engineering News-Record, \$115,-712,000, is 18 per cent less than the figure for the preceding week but 52 per cent above that recorded a year ago. The total shown for thirty-one weeks this year is 192 per cent more than the comparable sum in 1945. The increase in private construction is 499 per cent, and the advance in public construction is 65 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended July 27 is 124.1 per cent of the 1926 average, as compared with 124.2 for the preceding week and 105.8 a year ago.

bank reserves increased Member \$114,000,000 during the week ended July 31. Underlying changes thus reflected include a decline of \$65,000,-000 in Reserve bank credit and a decrease of \$161,000,000 in Treasury deposits with Federal Reserve accompanied by a rise of \$58,000,000 in money in circulation.

Total loans and investments of reporting member banks declined \$322,-000,000 during the week ended July A rise of \$164,000,000 in commercial, industrial and agricultural loans was recorded. The sum of these business loans, \$7,974,000,000, shows a net increase of \$2,071,000,000 in twelve months.

Thirty-five years' worth of experience at your service Precision gauge checking accuracy of boning operation



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FOR thirty-five years Sealed Power has been working in closest collaboration with leading engineers of the automotive industry, expanding plants, laboratory facilities and personnel as the needs of the industry increased. Today Sealed Power factories and the Sealed Power staff are at the peak, the finest in our long history. Our full resources and our thirty-five years of successful experience are at your service, to help make your good engines even better.

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Keep Your War Bonds! Get \$4 for \$3!

SEALED POWER PISTON RINGS
PISTONS—CYLINDER SLEEVES

ASTE to Hold Largest Semi-Annual Convention

The American Society of Tool Engineers has announced, through its president, A. M. Sargent, preliminary plans for the largest Semi-Annual National Convention in the Society's history to be held at Pittsburgh, Pa., Oct. 10-11, 1946. Highlights of the three-day schedule were made known after a recent meeting of the National Program and Host Chapter Committees in Pittsburgh.

Seminars on technical subjects, visits to industrial plants in the Pittsburgh area employing new production techniques, showings of engineering films, the semi-annual banquet, and many special events make up the comprehensive convention agenda.

Technical sessions, tentatively lined up, open Thursday afternoon, Oct. 10, with Stephen Urban of Pratt & Whitney, Syracuse, chairmanning a meeting devoted to "Welding and Design," followed in the evening by "Gas Turbine Tooling and Production," directed by Robert W. Ford of Ex-Cello Corp., Pittsburgh.

Friday morning, afternoon and evening sessions will treat "Precision Castings," "Tooling with Carbides," and "Manufacturing Analysis," with H. E. Lindsley of The Iron Age, New York; E. W. Baumgardner of National Carbon Co., Cleveland, and O. W. Win-

ter of Acme Pattern & Machine Co., Buffalo, in charge, respectively.

Fred L. On Saturday morning, Schmitt of D. A. Stuart Oil Co., Chicago, will conduct the final lectures, dealing with various phases of "Multiform Grinding."

Each morning during the meeting there will be a two and one-half hour program of "know-how" and "how-todo-it" motion pictures.

Tours of the Westinghouse Gear Works and the Irwin Works of Carnegie-Illinois Steel Corp. will be conducted Thursday afternoon. Open house will be observed Friday morning and afternoon by Firth-Sterling Steel Co. (McKeesport); National Works of the National Tube Co.; Mesta Machine Co.; Westinghouse East Pittsburgh Works: Westinghouse Airbrake Co.; (Turn to page 74, please)

Private and Commercial Aircraft Shipments*

By Size, Number of Engines and Horsepower

	SHIPMENTS			UNFILLED ORDERS (End of Month)		
	June	May	April	June	May	April
Airplanes, Total	3,429	3,073	2,311	47,657	46,143	39,992
Number of places: Fixed-wing planes: 2-place 3 and 4 places 5 to 9 places 10 to 49 places 50 and more places Helicopters - 2 and 4 places Number of Engines:	3,202 178 49	2,921 80 72	2,263	33,073 13,852 90 415 226	32,704 12,764 104 285 276 10	39,331
1 engine 2 engines 4 engines	3,381	3,001	2,263	45,943 443 266	45,496 371 276	39,358 345 289
Rated Horsepower: 1-74 hp. 75-99 hp. 100-399 hp. 400-749 hp. 750-3,999 hp. 4,000-9,999 hp. 10,000 and over	2,147 1,042 191	2,093 820 88	1,675 544 44	13,172 11,970 21,776 25 448 266	12,290 17,597 15,593 26 371 276	10,455 16,323 12,556 21 114 397 133

^{*-}Industry Division, Bureau of Census.

1946 Aircraft Shipments and Unfilled Orders*

In Units and Their Value

PRODUCT	Unit of Measure	SHIPMENTS			UNFILLED ORDERS (End of Month)		
		June	May	April	June	May	April
complete aircraft							
Airplanes, total	No. of planes	3,439(a)	3.198(a)	2,402(a)	51,270	49,952	42,83
	Value	\$32,440,370(a)	\$44,024,286(a)	\$44,557,363	\$1,054,927,503	\$1,036,285,614	\$1,045,273,81
For U. S. Military	No. of planes	60(a)	125(a)	91	3,613	3,809	2,84
F	Value	\$11,386,593(a)	\$19,875,535(a)	\$27,520,413	\$643,385,472	\$345,714,092	\$676,349,70
For other than military	No. of planes	3,429	3,073	2,311	47,657	46,143	\$368.925.11
Conversions	Value	\$21,053,777	\$24,148,751	\$17,036,940	\$411,542,031	\$390,571,522 131	\$300,920,1
CONTACT STORIES	No. of planes Value	\$4,292,356	\$4,997,911	\$3,370,761	\$18,187,964	\$21,537,442	\$23,671,76
irframe spare parts	Asina	34,232,330	\$4,007,011	\$3,370,761	\$10,107,004	321,001,442	440,011,11
For U.S. Military	Value	\$2,672,476	\$1.577.848	\$3,144,757	n, a,	n. a.	\$87,033,44
For other than military	Value	\$1,928,981	\$1,781,703	\$1,243,848	n. a.	n. a.	\$4,693,62
If other products		41,020,001	4111011100	*************			
Modifications	Value	\$411.204	\$172,098	\$858,914	\$4,551,706	\$647,420	\$4,666,9
Aircraft products	Value	\$999,158	\$1,038,841		\$42,979,982	\$37,636,704	
Non-aircraft products	Value	\$2,104,208	\$1,165,776	\$1,379,552	\$17,084,752	\$9,437,773	\$31,067,4

⁽a)—Excludes a few military aircraft to avoid disclosing the operations of individual companies.

*—Industry Division, Bureau of Census.

1946 Military Aircraft Shipments by Type*

	*	SHIPMENTS			UNFILLED ORDERS (End of Month)		
TYPE OF AIRCRAFT	Unit of Measure	June	May	April	June	May	April
Total—Military Airplanes. Bombers and heavy transports. Fighters, reconn. and photographic. Helicopters. Other	No. of Planes Value No. of planes No. of planes No. of planes No. of planes	\$11,386,593(a) 14 46 (b)	125(a) \$19,875,535(a) 32 93 { (b)	\$27,520,413(a) 27 64 { (b)	3,613 \$643,385,472 805 1,584 { 1,224	3,809 \$645,714,092 848 1,630 { 1,331	\$676,348,701 866 1,709 61 204

Excludes a few military aircraft to avoid disclosing the operations of individual companies.
 Not shown in order to avoid disclosing the operations of individual companies.
 Industry Division, Bureau of Census.



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TRIES

Here's Your 3-step plan for BETTER TOOLS TO CUT PRODUCTION COSTS

Use this sure way to knock the props from under production costs. Let Carpenter help you put this three-step plan to work in your tool room and heat treating department. With it you can reduce machine down-time and actually lower unit costs.

Cut The Cost Of Tooling-Up And Reduce Machine Shut-Downs!

Tool Engineers can now be sure of selecting the proper tool steel for each job when they use the Carpenter Matched Set Method. Many plants use this method of selection to lick production problems caused by premature tool and die failure. And it works! Now tool makers who have used it are relying on it to get every job done right. They know it cuts the cost of tooling-up and reduces machine shut-down time. And those savings are bound to show up in the cost of the finished product.

Insurance That Each Tool Will Pay-Off On The Job!

As you know, proper heat treatment is the second step to seeing that each tool is made to do its job right. And the Carpenter Heat Treating Guide quickly gives you this important information about each Carpenter Matched Tool Steel: Type analysis, Forging heat, Normalizing heat, Manealing treatment, Hardening treatment and Recommended draw-Annealing treatment, Hardening treatment and necessary oxidizing ing range. And this slide chart gives you tips on quenching, oxidizing atmospheres, heating time and heating speed for drawing. For your free copy, drop us a note on your company letterhead.

Check On Tool Life And Output Per Grind!

Find out which tools and dies need too frequent regrinding or fail prematurely in service. Carpenter Matched Tool Steels can help you lick this condition, and reduce unit costs. And for personal help in your tool room or heat treating department, get in touch with your nearby Carpenter representative. He knows tool steel inside-out, and can often provide the kind of engineering help that licks tough production bugs.





How the Carpenter Matched Set Method Helps to Solve Your Tool Steel Problems...

K-W

11 SPECIAL

STAR-ZENITH

D. Y. 0

EXCELO

These are really Matched Tool Steels, as one picks up its job where the other "leaves off."

The key steel is the one in the center, No. 11 Special, a straight carbon, tough timbre, water-hardening tool steel. When you have a tool to make, you first find out if it can be made from No. 11 Special. If the answer is "Yes", you go no further. But when the answer is "No", you use the diagram to point the way to the tool steel that will do the job. For greater wear resistance you go north. For greater hardening accuracy and safety, you move west, etc.

To learn more about the ways this method can be used in solving your special problems, ask for a copy of the 167-page Carpenter Matched Tool Steel Manual. It contains an 80-page tool index and steel selector that many tool engineers find extremely handy. For your copy, write us a note on your company letterhead, indicating your title. (Free in U. S. A.)

The Carpenter Steel Company 103 W. Bern St., Reading, Pa.

BRANCHES AT Buffalo, Chicago, Cincinnati, Cleveland, Dayton, Detroit, Hartford, Indianapolis, New York, Philadelphia, Providence, St. Louis

AIRBRIEFS

(Continued from page 40)

producing this great speed with an expenditure of power no greater than that presently employed. The air taken from the boundary layer would be routed into the turbojet engines, thereby eliminating the necessity for large air scoops which destroy the smooth flow over the wing.

Menasco Jets

Menasco Manufacturing Co., producer of low-powered air-cooled in-line

aircraft engines prior to the war and wartime manufacturers of hydraulic actuating units and other sub-assemblies, is nearing completion on its turbojet aircraft engine, which is believed to be the most powerful in the world. The engine is now about 80 per cent complete and is being built for Lockheed Aircraft Corp. for use in the giant Constitution transport plane. Lockheed, which owns a considerable interest in Menasco, has contracted for 250 of the engines at a cost of \$2,400,000. Design work on the new en-

gine was done by Lockheed engineers. Menasco continues its production of landing gear struts, aircraft servicing equipment and the "Electro-Mite" portable washing machine, of which 20,000 have been completed.

British Jets

John Wilmot, Labor Minister of Supply, has announced that Great Britain plans to convert its entire aircraft production program to jet propelled types, including airline transports. The 100-ton Saunders-Roe 6-engined flying boat and the giant Brabazon type, both of which are well advanced, will be completed with jet units. Great Britain leads the world, at present, in turbo-jet engine design with the Rolls-Royce Nene and the De Havilland Ghost, both of which develop 5000 lb static thrust.

Merlin Skymaster

Canadair, Ltd., Canadian aircraft manufacturer, has completed the first of its Rolls-Royce-powered Douglas DC-4 modifications. The first plane of a number being produced for Trans-Canada Air Lines has been successfully test flown and reveals increased speed at altitude over the standard radial-engined DC-4. The work consists of installing four Rolls-Royce Merlin liquid-cooled engines in surplus DC-4's. Designs and drawings have been furnished by Douglas Aircraft Co., which, however, has no plans for manufacture of the liquid-cooled Skymaster version.

Magnesium Engine

Nelson Aircraft Corp., San Lendro, Calif., has announced a 25 hp aircraft engine built largely of magnesium. The design is a four-cylinder, two-stroke type with die cast magnesium cylinders containing cast steel sleeves. The engine is horizontally opposed in design and is air-cooled. It will be used to power the Nelson Bumblebee two-place powered glider. Production is scheduled at the rate of 150 per month.

Crosswind Gear

The Civil Aeronautics Administration has awarded \$150,000 in development contracts aimed at exploitation of the swiveling landing gear which permits airplane landings on the runway despite strong crosswinds. To date \$20,000 has been awarded to Goodyear Aircraft Co. and \$6000 to Fairchild Aircraft Corp., the remainder earmarked for early commitment. Although many engineers are dubious of the safety and advisability of utilizing (Turn to page 60, please)



Sufficient adjustment is provided in the Atwood Spring Loaded Clutch to allow the driven plate facings to be completely worn out.



OVER A MILLION ATWOOD CLUTCHES IN SERVICE
*TUE ATWOOD CLUTCHES IN SERVICE

AUBURN, INDIANA, U. S. A.

*Formerly Auburn Manufacturing Company



Michigan Welded Steel Tubing is available in sizes and shapes that make it readily usabletin the production of a wide variety of parts. Whether you form and machine the parts in

your plant or order them prefabricated by Michigan, you will find this tubing exceptionally uniform in structure and adapted to reworking by any production process. Michigan welded tubing can be:



Engineering advice and technical help in the selection of tubing best suited to your needs. Address your inquiries to:

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TRIES

swiveling main wheels on a lightplane, CAA is anxious to explore the possibilities in an effort to improve the reliability and simplicity of lightplane flying. The crosswind gear was origiflying. nally developed in England, but has been abandoned.

Glass Floats

Benton Harbor, Mich., is now marketing a lightplane float design made of glass plastic materials. The new floats cost about onethird less than standard aluminum alloy models and are impervious to salt water. The new material provides an extremely smooth exterior finish and is considerably lighter than aluminum.

Stinson Family

Stinson Division of Consolidated Vultee Aircraft Corp. is developing a complete "family" of lightplanes including: the four-place Voyager 150 now in quantity production, a twoplace model in the low-price range, a three-place design, a five-place Sky Coach and a twin-engined executive model to seat five or six.

Boeing Performance

Boeing has announced first preliminary performance figures on its Model 417 feederliner, due for flight tests this fall. It is expected to weigh 18,700 lb and accommodate 20 passengers at a speed of 196 mph. It will operate from 3000 ft. runways and maintain a 14,450 ft. altitude on one engine.

Jutput Cut

Original production goal of 5000 Republic Seabee 4-place amphibians for 1946 has been cut to 3000 units due to shortages in materials and sub-contracted parts occasioned by recent

Aeronca Production

Aeronca Aircraft Corp., Middletown, Ohio currently claims the highest lightplane production rate in the U. S.-43 aircraft per day with a rate of 50-perday slated by early fall.

BOOKS

SYMPOSIUM ON STRESS CORROSION OF METALS, published jointly by American Society for Testing Metals and Institute of Metals Division, American Institute of Mining and Metallurgical Engineers.

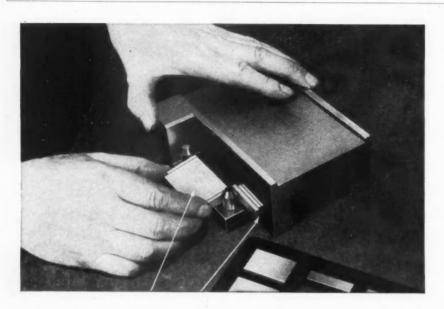
Metallurgists and many other scientists and engineers concerned with corrosion will be interested to know that the papers and discussions given at the joint A.S.T.M.and discussions given at the joint A.S.T.M.-A.I.M.E. symposium on stress-corrosion cracking held in Philadelphia in Nov. 1944 are now available in bound form. This volume, the first to bring together present-day knowledge and recently determined data on the failure of metals and alloys under conditions of combined stress and correction has been edited by Carter S. corrosion has been edited by Carter S. Cole of the A.S.T.M. staff.

The whole field of stress-corrosion cracking was thoroughly covered at the three-day meeting; there were papers on the ing was thoroughly covered at the three-day meeting; there were papers on the theory of stress-corrosion cracking, on test methods, on the failure of brass and other copper-base alloys, on the testing and susceptibility to failure of the light alloys, and on stainless steel, galvanized steel, bridge wire, and a series of other meterical including mische and mische alloys. materials including nickel and nickel alloys, lead alloys, and low-carat gold.

lead alloys, and low-carat gold.

The volume containing these papers and discussions will be sold to members of the two cooperating societies at \$5 for one copy, and to non-members for \$7.50. Members of the Institute of Metals and the Iron and Steel Institute of Great Britain may purchase copies for \$5.50 each. All of the books will be sold through the A.I.M.E.

TREATISE ON MILLING AND MILL-A TREATISE ON MILLING AND MILL-ING MACHINES, published by The Cincin-nati Milling Machine Co. 168 pages with illustrations. The third edition of this well-known treatise on milling machines brings up-to-date a text which has served as a standard work on the subject for many years as a background for students, teach-ers, engineers, and machine operators. The ers, engineers, and machine operators. The subject has grown to such an extent in recent years as to make it impossible to discuss even briefly between the covers of a single book. Consequently, the present text is offered as Part One of a series of books to be released later. The text covers in a general way the function and operations of milling machine as well as the cutting tools used for such operations. The chapters on materials for cutting tools, sizes, shapes, and styles of milling cutters are based on the latest and extensive cutting metal research conducted by the Research Department. ment.



Certifying the spacing of location pins on a fixture, with two combinations of Jo-Blocks. When the Jo-Blocks

say "it's right"—then it's RIGHT!

Since the hours your engineering and tool-room staffs put into a precision fixture, jig or die can so easily represent a dead loss, if a single critical dimension is incorrect, doesn't it strike you that the use of genuine, warranted Jo-Blocks is a mighty sensible precaution?

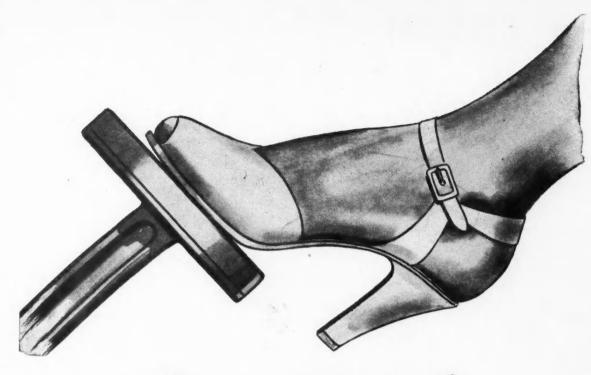
When you take a measurement with Jo-Blocks and the Jo-Blocks show the dimension is per specification . . . that's that! Genuine Johansson Gage Blocks are warranted accurate to within .000002", .000004" or .000008", ±. They are made in America by Ford Motor Company only. They are used by hundreds of manufacturers, as master gages to check working gages, micrometers, etc., as precision layout tools and frequently as actual working gages (since the cost of an individual Jo-Block or two is often appreciably less than that of a specially-built working gage).

If your plant-particularly your tool-room-is operating without the reassuring control of a set of genuine Ford Jo-Blocks and Accessories, it would be well to consider this very moderate investment. Ford Motor Company, Johansson Division, Dearborn, Michigan. Dept. 38.



YOUR NEW COMPLETE JO-BLOCK CATALOGI





Soft Touch!

Long clutches respond instantly, smoothly—with effortless dependability—to dainty feminine touch or the heavy-footed commercial driver.

The Long semi-centrifugal clutch has greater torque capacity at increased speeds—its feather-light action requires only a "soft touch" at any speed.



LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION
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CLUTCHES • RADIATORS • OIL COOLERS

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Spray Granodizing metal surfaces assures a durable, lustrous paint finish. The smooth, tight, hard, phosphate coating anchors paint to the metal for permanent protection; preventing the spread of rust from accidental injury to the paint finish.

The appealing beauty of the paint finish when applied to a Granodized surface will endure, whether it be the finish of automobile, refrigerator, washing-machine, kitchen cabinet or other products constructed of sheet metal.

PAINT DURABILITY IS Certified WHEN METAL SURFACES ARE GRANODIZED



MANUFACTURERS OF INHIBITORS AND METAL WORKING CHEMICALS

AMERICAN AMBLER



New Products for Aircraft

(Continued from page 44)

The material, sprayed on like paint, is of aluminum color, and keeps out the ultra-violet rays of the sun which are the chief factors in the aging that results from direct exposure to sun. The color also keeps the De-Icer cooler by reflecting the sun's heat rather than absorbing it.

First trials indicate that about one and a half gallons of the material would be used for a plane of the DC-3 size, and the added weight would amount to only about five lb. Time required to spray and dry a job of this size will be considerably less than three hours, the test showed.

Air Freight Securing Gear

A webbed strap equipped with hooks and buckles, and a special blanket are being introduced by Air Associates, Inc., Teterboro, N. J., as the Davis Cargo Tydown Gear for securing air freight. Both the tie-down strap and the blanket are adaptations of equipment originally designed for use in Navy ambulance planes where quick attachment and release of securing devices was of prime importance.

The cargo tie-down strap can be varied from its greatest length to two ft without reducing holding efficiency.



The Davis Cargo Tydown Gear.

One end of the strap is fitted with a permanently secured metal hook for attachment to wall or floor rings of the airplane, while the other end is free to be inserted through a quick-adjusting, friction-locking buckle and secured at any point along the strap's length. In the loop formed by passage of the free end through the quick-release buckle, a second metal hook is provided which is free to ride on a rotating sleeve. Its design is such that it constitutes a block and tackle type arrangement whereby tension can be increased on the strap at any time. A feature

(Turn to page 64, please)

This standard platen type Simplimatic, specially tooled for machining rear axle drive gear bubs, in combination with standard tool slides, is equipped with motor-driven quill for rotating the boring bar. Part is completely machined with 7 rough and finish cuts in 2½ minutes, floor to floor.

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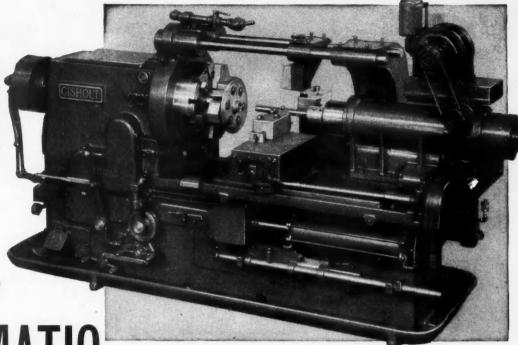
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THE GISHOLT

SIMPLIMATIC makes it SIMPLE — and FAST!

• Here's another example of the adaptability of the Gisholt Simplimatic—a standard machine which gives you all the advantages of an automatic lathe individualized for the specific job.

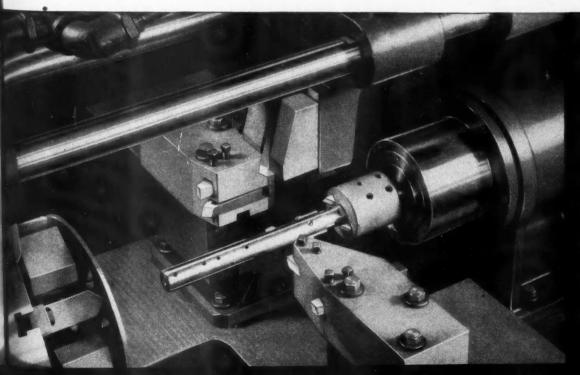
This is made possible by the large horizontal platen table which permits a greater number of independent tool slides, each favorably cammed for its own particular cut, and providing an ideal condition for each tool as to cutting speed

and feed, order of engagement, dwell and retract.

Rugged, fast, and accurate, the Simplimatic pays dividends in any shop, small or large, seeking maximum production at minimum cost. Ask for complete information.

GISHOLT MACHINE COMPANY
1205 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . with Gisholt



TURRET LATHES
AUTOMATIC LATHES
SUPERFINISHERS
BALANCERS
SPECIAL MACHINES

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FRIES

ngereasture of the buckle is a crossbar which collapses before sufficient tension can be applied to the strap to pull out the rings incorporated in the airplane structure.

The six by eight ft cargo blanket, designed for use in conjunction with the strap, is made of heavy duck and reinforced with webbed straps. At the end of each strap, and wherever the straps cross, loops are provided for attachment of hooks, allowing the blanket to be folded for smaller size articles and still be strapped from any point to the plane structure. Through the use of "S" hooks, several blankets can be joined to form a continuous blanket strip.

Ignition Wiring Tester

The Vibrotest Model 241 is a new aircraft ignition wiring tester, a product of Associated Research, Inc., 231 S. Green St., Chicago 7, Ill. It weighs 17 lb and is protected by shatter-proof glass. A metal shield over the Bakelite portion prevents mechanical injury.

The range of the instrument is from 0 to 2000 megohms at 1000 volts potential. Special scale distribution puts the 150-megohm point about one-third up the scale. The part of the scale arc below this 150-megohm point is red, while that above is colored green to aid reading. Twelve-ft leads are provided with instantly applicable termi-



Vibrotest Model 241 aircraft ignition tester.

nals. The leads are housed in the case cover, so they can be left permanently connected with the meter. The power source is self contained, and readings are made by a push-button switch.

New Aviation Fuels Standardized by Mobilgas

The Socony-Vacuum Oil Co., 26 Broadway, New York, N. Y., is standardizing its aviation gasoline on a national basis, similar to that prevailing in the automotive field.

The company is prepared to market three popular commercial grades from coast to coast. Newest in the line is Mobilgas Aircraft 80, an 80 octane clear unleaded fuel which replaces both the Mobilgas 73 and 80 octane aviation gasolines containing tetra ethyl lead. This new grade is designed to meet the demands of private fliers whose engines require 73 and 80 octane anti-knock fuel.

The other two grades are Mobilgas Aircraft 91 and Mobilgas Aircraft 100, designed to fill the needs of commercial operators and some types of privately owned planes requiring 91 octane fuel. Both the 91 and the 100 octane fuels have lower lead content than that used in similar wartime aviation gasolines.

Advertising Notes

Vernon H. Van Diver has opened his own business as merchandising and advertising counselor with offices in the McGraw-Hill Building, New York City. He will also head The Brad-Vern Co., advertising agency at Garden City, N. Y.

The Chicago home offices of Theodore R. Sills & Co., public relations counselors, have moved from 43 E. Ohio St., to Suite 1020, 30 S. LaSalle St., Chicago 3.

The firm's New York office is located in Suite 412 at 502 Park Ave., New York 22.



Reuther Conference Dud

(Continued from page 19)

our employes, who are members of the UAW-CIO, approximately 15,000,000 manhours of work, or better than \$20,-

"I wish I could say to you that the situation has improved. Unfortunately it has not. We stopped production of passenger cars in our plants on Tuesday noon (July 30). This shutdown was brought about by a strike in the plant of the Dura plant in Toledo which supplies our body hardware. This strike has been in progress since July 25. To date it has necessitated the lay-off of 4000 of our employes. If it is not settled in the next two or three days it will necessitate the laying off of some 5000 additional men. While the Dura strike actually forced this shut-down of our final assembly lines, it is only one of seven strikes currently in progress in plant of our suppliers. Probably the most serious of the other six is that in the plant of the Firestone Steel Products Co. in Akron, Ohio, which supplies our wheel rims. Even if the Dura strike is settled, we have little hope of being able to resume production at the level prevailing prior to last Tuesday until after the Firestone Steel Products Co. strike is settled. We hope to find a substitute source of supply for wheel rims but we doubt seriously whether we can find one with sufficient capacity to meet our present requirements."

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STRIES

Studebaker Chronology

Typical of what has been happening in the automotive industry since V-J Day, the following chronology prepared by Stude-baker lists the suppliers' strikes that have resulted in stoppages and interruptions of its production:

1945

Aug. 9-Last military truck produced.

Aug. 14—V-J Day.
Aug. 14—Employes of Pottstown, Pa.,
plant of the Spicer Manufacturing Corp., which supplies our propeller shafts, go out

Aug. 28—Employes of Pressed Metals of America, which supplies our shackles and

shackle bolts, go out on strike.

Aug. 31—Last M29-C Weasel (military carrier) produced.

Sept. 26—Employes of the Warner Gear Division of the Borg-Warner Corp., which supplies all of our passenger car and truck

transmissions, go out on strike.

Oct. 1—Employes of the Toledo plant of the Spicer Manufacturing Corp., which supplies our axles, go out on strike.

Oct. 8—Production of Model 5G passenger

cer, M-15, M-16 and M-5 trucks scheduled to start, but delayed primarily due to strike-enforced shutdown of Warner Gear Division of Borg-Warner Corp.

Oct. 8—Strike settled at Pressed Metals

America.

Oct. 10-Six pilot units of the Model 5G

Pottstown plant, strike settled.
Oct. 20—Employes of Pittsburgh Plate Glass Co. and Libbey-Owens-Ford Glass Co.

go on strike. (Both companies supply us with glass.)

Oct. 22-Employes of Midland Steel Products Corp., Cleveland (our sole source of frames), slow down.

Oct. 29—Strike settled in the Toledo plant of the Spicer Manufacturing Corp. Nov. 1-Employes of the Cleveland

Graphite Bronze Co., which supplies our

Graphite Bronze Co., which supplies our engine bearings, go out on strike.

Nov. 15—Employes of the Yale & Towne Manufacturing Co., which supplies our locks and keys, go out on strike.

Nov. 20—Employes of AC Spark Plug Co., which supplies our fuel pumps and air cleaners, go out on strike.

Nov. 20—Employes of Delco Remy Corp., which supplies our horns, go out on strike.

which supplies our horns, go out on strike.

Dec. 3—Production started on Model
M-15 truck after delay of nine weeks due
to strikes in plants of suppliers.

Dec. 7—Production started on Model 5G
passenger cars to fill up lines in anticipation of early settlement of Warner Gear

Strike.

Dec. 11-Production started on Model

M-5 truck after delay of 10 weeks due to strikes in plants of suppliers.

Dec. 13—Production stopped on Model 5G passenger cars as transmissions on hand are used up and Warner Gear strike is still unsettled is still unsettled.

Dec. 13—Production stopped on Model M-15 truck due to continuation of Warner

Gear strike.

Dec. 18—Production stopped on Model
M-5 truck due to continuation of Warner

Gear strike.

Dec. 26—Warner Gear strike settled.

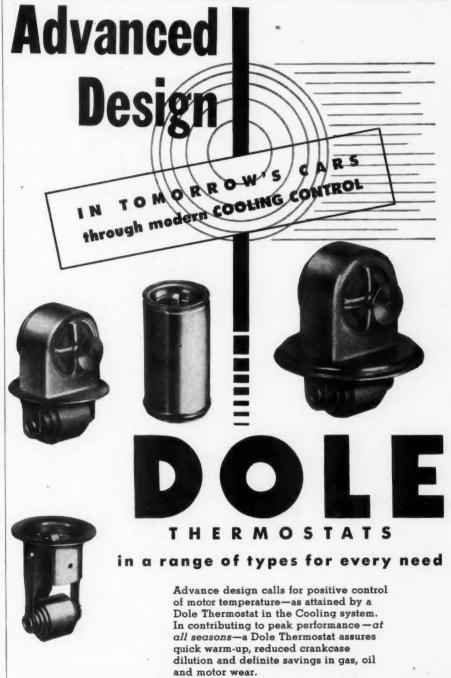
Dec. 26—Cleveland Graphite Bronze strike settled.

Jan. 2—Production resumed on Model 5G passenger cars after delay of 12 weeks due to strikes in plants of suppliers.

Jan. 2—Production resumed on Model

M-5 and M-15 trucks.

(Turn to next page, please)



VALVE COM

1901-1941 Carroll Avenue, Chicago 12, Illinois

PHILADELPHIA

Jan. 10-Production started on Model M-16 truck after delay of 13 weeks due to strikes in plants of suppliers

Jan. 19-General steel strike called.

of Jan. 19-Employes Schwitzer-Cummins Company, which supplies us water pump parts, go out on strike.

20-Copper smelters, refiners and fabricators go out on strike.

Jan. 21—Pittsburgh Plate Glass Co. and Libbey - Owens - Ford Glass Co. strikes settled.

Feb. 15—General steel strike settled.

Feb. 18—Production of 6G passenger cars scheduled to start but delayed by strikes in suppliers' plants which have held up com-pletion of 5G passenger car run.

March 18—Model 5G passenger car pro-uction schedule completed eight weeks duction

March 20-Delco Remy strike settled.

March 25-Employes of Midland Steel Products Co. go out on strike.

March 25-Schwitzer-Cummins Co. strike settled.

March 27-Employes of McInerney Spring & Wire Corp., which supplies our cushion springs, go out on strike.

April 1-Yale & Towne Manufacturing Co. strike settled.

April 1-Coal strike called.

April 1-Employes of Industrial Rubber Goods Co., which supplies us with all kinds of rubber parts, go out on strike.

April 15—Employes of Ross Gear & Tool Co., which supplies our steering gears, go out on strike.

April 18-Employes of Lamson & Sessions Co., which supplies part of our bolts, nuts and cotterpins, go out on strike.

April 18—Employes of National Screw and Manufacturing Co., which supplies us with bolts and nuts, go out on strike.

April 20--Midland Steel Products Co strike settled.
April 22—Production of 6G passenge

cars scheduled to start after delay of nine weeks due to strikes in plants of suppliers but again postponed because of Midland

Steel strike.

April 25—Employes of American Stamp. ing Co., which supplies our hose clamps, go out on strike.

April 26—Employes of the Spicer Manu-

facturing Co., Pottstown plant, go out on strike.

April 29-Employes of Clark Equipment Co which supplies our axles for Mtruck, go out on strike.

April 29—Employes of Oshkosh plant of Timken-Detroit Axle Co., which supplies with two-speed truck axles, go out on

strike.
May 7—Production started on Model 66 1947 Champion after delay of 11 weeks due

to strikes in plants of suppliers, May 13—Coal strike settled. May 15—Employes of Michigan Bumper Corp., which supplies our bumpers, slow

May 16-Production of Model 6G stops due to break in our main power line.

May 20-Production of Model 6G resumed.

May 20-McInerney Spring & Wire Corp.

strike settled. May 21-Employes of Sealed Power Corp.,

which supplies us with piston rings, go out on strike.

May 23-Railroad strike called

May 27-Ross Gear and Tool Co. strike settled.

May 27—Production stopped on Model 6G due to shortage of parts as result of coal and railroad strike.

May 27—Production stopped on Model M-5, M-15, M-16 trucks due to parts shortages as result of coal and railroad strikes.

June 1—Railroad strike settled.

June 1-Strike of copper smelters and refiners settled.

June 3—Production resumed—all models. June 7—Railway employes of Jones & Laughlin Steel Corp., one of our steel suppliers, go out on strike.

June 10—Spicer Manufacturing Corp. (Pottstown plant) strike settled.

June 14-Jones & Laughlin Steel Corp.

rail strike settled. June 20-Employes of Marlin Rockwell Corp., which supplies us with bearings, go

out on strike. June 24—Strike settled at Clark Equipment Co.

July 5-Production on Model 6G stopped

due to shortage of parts.

July 8—Production resumed on Model 66. July 8-Strike settled at American Stamp-

ing Co. July 8-Strike settled at Industrial Rubber Goods Co.

10-Employes of Firestone Steel Products Co., which supplies our passenger car wheel rings and locking rings for trucks, go out on strike.

July 15-Strike settled at Timken-Detroit Axle Co. (Oshkosh plant).

July 17—Employes of Electric Auto-Lite o. (Toledo plant), which supplies our ig-

nition equipment, go out on strike.

July 20—Strike settled at Electric Auto-

July 21-Production stopped on passenger cars due to shortage of ignition parts as a result of Electric Auto-Lite Co. strike.

July 23-Production of passenger cars resumed.

July 25-Employes of United States Rubber Co. (Detroit plant), which supplies us molded rubber parts, go out on strike.

July 25—Employes of Dura Co. (Tole

plant), which supplies our body hardware, go out on strike.

July 26 — Employes of Blanchard

Brothers & Lane Co., which supplies our leather, go out on strike. July 27—Strike settled at United States Rubber Co. (Detroit plant).

July 30-Production stopped on passenger cars due to shortage of body hardware as a result of Dura Co. strike.

later than originally planned. March 20-AC Spark Plug Co. strike

settled.

are eliminated in the standard Detrex

"624" solvent vapor degreaser.

SMALL DEGREASERS FOR RTS CLEANING



DETREX "624"

Less than three minutes are required for complete cleaning in the boil-rinse-vapor cycle. Tedious hand wiping is ended; fire hazards, created by gasoline dips, are out.

The "624" is durable. Fabricated from heavy steel plate, it is of all-welded construction reinforced with structural steel. Interiors are zinc coated. Small, the entire unit takes up less than eight square feet of floor space.

> Either PERM-A-CLOR or TRIAD solvents are recommended for use in the "624". For full information, call a Detrex representative today, or write direct to the address below.



Another Important Advantage of VICKERS OVERLOAD RELIEF VALVE ENGINE DRIVEN VICKERS VANE PUMP VICKERS POWER STEERING BOOSTER Representative Applications of VICKERS HYDRAULIC POWER Requiring only a minimum of space for installation, the Vickers Hydraulic Power Steering System can be applied to most STEERING existing hand steering mechanisms with a few simple alterations. The separate power cylinder (booster) can be located where it does not interfere with other apparatus and where the power will be applied directly to (and in line with) the drag link. No additional space is required at the end of the steering column where space is usually at a premium.

Other important advantages of Vickers Hydraulic Power Steering are: effortless, positive and shockless steering . . . road shock thrusts are transmitted to the frame of the vehicle instead of to the steering gear . . . automatic overload protection . . . reduced operator fatigue . . . greater road safety . . . automatic lubrication . . . and 15 years of successful operating experience. Bulletin 44-30 gives complete information about Vickers Hydraulic Power Steering; write for a copy.

VICKERS Incorporated

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August 15, 1946

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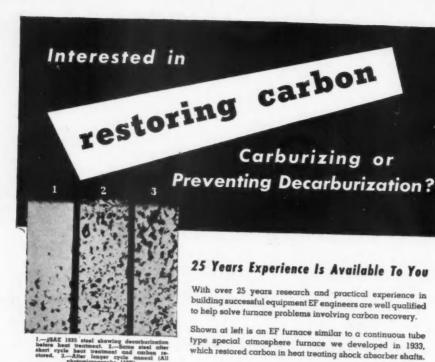
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EF continuous and batch type furnaces equipped with our special atmosphere control. Possibly many other furnaces now in operation could be converted for carbon restoration or the skin recovery process. Whether you are interested in restoring carbon;

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Below is a more recent installation in which carbon

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All New Car Prices Increased by OPA

Retail ceiling prices for all new passenger automobiles have been raised an average of 7.3 per cent over June 30. 1946, levels to meet the requirements of the new price control act, according to an announcement by the Office of Price Administration. The new list prices became effective Aug. 12, 1946. This increase in list prices is necessary to conform to a provision of the new price control act which prohibits OPA from reducing the established peacetime retail discounts or mark-ups for certain reconversion goods "before the retail unit sales of such commodity for a period of six months shall have reached the six months' rate for the calendar years 1939 to 1941, inclusive." Manufacturers' maximum prices remain unchanged.

Typical of the new prices for passenger automobiles with standard equipment are those of four-door sedans. These are listed below and are followed in each case by the price ceilings for the same models prior to this latest official action, and the amount of the increase. These prices include list prices, but not Federal excise taxes, handling and delivery or transportation charges.

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New	Previou	
Make and Model Price	Price	increase
Buick Series 40\$1346	\$1250	\$ 96
Buick Series 50 1567	1459	108
Buick Series 70 1824	1699	125
Cadillac Series 61 1935	1794	141
Cadillac Series 62 2105	1951	154
Cadillac 60 Spec 2799	2590	209
Cadillac Series 75 3926	3633	293
Chevrolet Fleetmaster 1076	1002	74
Chevrolet Stylemaster 1005	936	69
Chrysler Royal 1452	1353	99
Chrysler Royal 1452 Chrysler Windsor 1554	1449	105
Chrysler Saratoga 1757	1636	121
Chrysler New Yorker. 1841	1714	127
DeSoto DeLuxe 1343	1251	92
DeSoto Custom 1412	1316	96
Dodge DeLuxe 1261	1176	85
Dodge Custom 1325	1235	90
Ford DeLuxe 1068	995	73
Ford Super DeL 1134	1057	77
Hudson Super Six 1360	1257	103
Hudson Commodore 6. 1496	1384	112
Hudson Super Eight 1492	1377	115
Hudson Commodore 8. 1563	1446	117
Lincoln Model 73 2059	1919	140
Lincoln Model 73		
(with custom inter.) 2191	2042	149
Mercury 1333	1241	92
Nash 600 Series 1206	1119	87
Nash Ambassador 6 1366	1262	104
	1163	88
	1243	94
Oldsmobile Std. 76 1337 Oldsmobile DeL. 76 1440		102
Oldsmobile DeL. 76 1440	1338	97
Oldsmobile 78 St 1390	1293 1388	105
Oldsmobile 78 DeL 1493	1458	107
Oldsmobile 98 1565		114
Packard Six 1624	1510	
Packard Eight 1682	1565	117 122
Packard DeL. 8 1746	1624	155
Packard Super 8 2141	1986	209
Packard Cust. Sup. 8 2863	2654	
Plymouth DeLuxe 1142	1069	73
Plymouth Spec. DeL 1174	1097	77
Pontiac Torpedo 6 1213	1127	86
Pontiac Torpedo 8 1240	1152	88
Pontiac Streamliner 6. 1285	1194	91
Pontiac Streamliner 8. 1312	1219	93
Studebaker 1947 Models		
Studebaker Champ.		
DeL 1238	1158	80
Studebaker Champ.		
Regal DeL 1304	1221	83
Studebaker Com. DeL. 1467	1370	97
Studebaker Com.		
Regal DeL 1581	1477	104

MEN AT WORK

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PRECISION INDUSTRIES INC.

Standard Brings Out New Motor Oil

Standard Oil Co. (Indiana) has just placed on the market "Permalube," a new motor oil developed during the war. Post-war material shortages, which have previously made it impossible to supply this new oil for use in civilian vehicles, are now rapidly disappearing, and there is every prospect that within a little over a month the product can be made available at service stations to all who want it.

Permalube is a highly refined and treated lubricating oil to which certain patented ingredients which increase its

usefulness have been added. It is made by taking a choice fraction of selected crude and extracting all but the most desirable constituents. The refined base stock is treated in various ways to improve its purity, and the several new and patented ingredients are then added in relatively small amounts but with major effects on the properties of the oil.

The result is a motor oil which is said to have all the basic properties considered desirable in any good lubricant, including the ability to reduce friction between moving parts to a minimum. It has special capacity to protect against varnish deposits on pis-

tons, cylinders, and other vital engine parts, against sludge deposits, against bearing corrosion, and against deterioration or breakdown of the oil itself.

A. J. Schamehorn

A. J. Schamehorn, 58, assistant administrative engineer of the General Motors Technical Center, died suddenly Aug. 5 at his office in the General Motors Building.

ASTE Convention

(Continued from page 56)

Aluminum Co. of America (Extrusion Plant), and James H. Mathews Co. All Thursday afternoon plant tours will be repeated Friday, Oct. 11. One of the extracurricula highlights of the Convention will be two special performances at the Buhl Planetarium to be staged Saturday afternoon for A.S.T.E. members and guests.

Concluding feature of the 28th National Meeting of the A.S.T.E. will be the semi-annual banquet on Saturday evening, with a prominent industrialist as the principal speaker. An orchestra and floor show will follow the speaking program.

News of the Industry

(Continued from page 50)

up much better on the basis of tabulations from 24 states for the month of June. New trucks registered numbered 13,370 as compared with 16,774 for the same states in June, 1941. When figures for other states accounting to 76 per cent of new truck sales are completed, it is estimated that the total for June may surpass the 1941 figures. So far this year, total truck registrations for the U. S. are 190,094, which compares with 299,606 for similar states and the same period in 1941.

Finance Groups Recommend Liberalized Credit Rules

An indication that finance companies fear a shortened market from high prices of automobiles and other goods under present provisions of Regulation W, which imposes certain restrictions on time payment buying, is seen in the action of the American Finance conference urging that credit buying regulations be liberalized.

With the present prices of lowest priced automobiles hovering around \$1200 to the customer, a down payment of one-third as required under Regulation W would constitute an out-of-pocket minimum payment of at least \$400, about half the price of a low-priced car before the war. On the basis of recent surveys, a large proportion of the income group comprising the volume market for cars does not have that much in savings.



Design engineers are increasingly specifying Simmonds Push-pull control systems in installations involving the transmission of loads in cycling operations. Precision engineered, and trouble-free in operation, Simmonds Push-pulls Sketch shows set-up for cycling test now being conducted on Simmonds Light Duty the Land push-pull. It has already been cycled #4L Push-pull. It has already been cycled deliver loads up to 60# in both the pull (tension) and the all-important push (or compression) 4,000,000 times (120 times a minute) with load. (Heavier loads can be handled; for details a 10 lb. load in both compression and tensee Design Data Table.) sion. Resulting backlash growth is less

They are being used on machinery for stamping, feeding and counting; to actuate windshield wipers; and in operations on looms and textile machinery.

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NOTE THE PLUS VALUES OF SIMMONDS PUSH-PULL SYSTEMS

ENGINEERED UNITS - Simmonds Push-pulls are engineered units, designed to transmit mechanical motion directly between points of application and operation, without complicated intermediate connections. They consist of a sliding linkage and a housing that may be rigid or flexible, or both. Their superior qualities have been proved in nearly a million wartime installations.

ADAPTABLE TO MANY JOBS - There are three types of Push-pulls, each available with a variety of fittings to make them adaptable to many jobs. Straight-line motion can be converted into rotary or angular travel; cycling operations are readily handled.

PRECISION CONTROL - The patented link-

age delivers an accurate movement both in the compression (push) and tension (pull) stroke, and will move loads up to 60 pounds, depending on the installation. The length of stroke remains the same regardless of variations in distance between ends; backlash is negligible.

ECONOMY OF INSTALLATION — Simmonds Push-pulls are delivered engineered to specific requirements, pre-formed and assembled, thus saving considerable design and assembly time. Frequently, cumbersome alternative assemblies are replaced which cost more than the more efficient Simmonds units.

DETOUR FIXED INSTALLATIONS—Simmonds Push-pull Systems are adaptable to simple or complex routings; they are easily installed so as to follow awkward contours and to travel around corners.

ABSORB VIBRATION -- For vibration problems, as on flexibly mounted engines, Simmonds Controls have proved capable of almost unlimited service. In most cases, they outlast the life of the unit served.

EASE OF MAINTENANCE-Self-housed and sealed against moisture, dirt and acid, Simmonds Push-pulls normally require little or no service. They are delivered lubricated for life.

Check the application of Simmonds Pushpull Systems to your mechanical remote control problems. Write on company letterhead for a free engineering analysis.

DATA FOR DESIGNERS

	Light Duty #4L Control	#5 Control	#7 Control			
Outer Diameter of rigid tubing Maximum compression load	2.10	5/16" 40 lbs.*	7/16" 60 lbs.*			
(heavier in tension) Length of stroke (or travel)	From 0" to 5" with standard fittings; longer on special applications.					
Weight with rigid tubing	0.1 lbs./ft.	0.12 lbs./ft. (average)	0.20 lbs./ft. (average)			

 These loads may be exceeded depending on application; up to 600 lbs. can be handled in specially engineered installations.

ALL TYPES AVAILABLE WITH RIGID OR FLEXIBLE CASING ALL TYPES EXCEED ARMY-NAVY SOECIFICATIONS

TO ORDER: Submit plan and side elevation sketches of principal dimensions, showing necessary bends. Give length of desired stroke, or travel, and other pertinent information. Simmonds will engineer a control to your specific require-



than .028".

Standard Linkage — Steel beads are strung on cable. Beads form column to give a maximum compression stroke; cable carries tension.



Light Duty Linkage - Phosphor bronze bearing rings, swaged on flexible steel cable, give light but rugged performance.



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Rocket Engine Fuels

(Continued from page 23)

spontaneous reaction with nitric acid. One of these hydrocarbon groups was Visol, derived from alcohols or phenols, which, with nitric acid, was used to power the Wasserfall flak rocket. This fuel produces a higher energy release than hydrogen peroxide and the Germans had plans for its production in vast quantities at the end of the war. It produces remarkably smooth combustion and the reaction is easily controlled. It is safe to store for periods

up to one month and is easily handled with no tendency to explode. However, the nitric acid is highly corrosive and presents problems in the selection of materials for fuel tank faurication.

Xylidine, amine compounds and other aniline acids have been tested with nitric acid as rocket liquid fuels. Generally, greater impulse is generated and the combustion is smoother with these compounds than with hydrocarbons. Xylidine is a homolog analine found in

coal tar residue. It has a high boiling point, which preserves its viscosity in the tank up to very high altitudes. The Germans considered constant viscosity at different altitudes and temperatures extremely important and, since early experiments revealed the difficulties presented by this problem, established this characteristic as a fundamental criteria for rocket fuels.

The amines are derives from ammonia, which is alkaline and which, when mixed with nitric acid, produces great heat. The nitric acid, which consists of 76 per cent oxygen by weight, provides the oxygen for combustion.

BORON COMPOUNDS—This is one of the most promising new fields of development and is being thoroughly explored by the Army Air Forces in connection with their extensive guided missile program. Boron has had little commercial value to date with the exception of boric acid, a mild antiseptic, and borax, the well-known water softener. However, the AAF has great hopes for the work now being pressed on boron derivatives, chiefly because they comprise fuels which will permit rocket operation in the outer atmosphere.

PENTOBORANE — This is theoretically a considerably greater hydrogen producer than other fuels examined. To date it is only in the very early stages of experiment and not enough samples have been tested yet to provide adequate data.

DIBORANE—This possesses an extremely high boiling point and shows extremely great promise.

ALUMINUM BOROHYDRIDE—The most promising feature of this compound is its heat of oxidation, which produces 13,814 kg-cal per mole, an extremely high value. It flashes in air, and releases 74 per cent of its hydrogen in combustion. It charges in water and is soluble in ether. It is extremely promising as a rocket liquid fuel.

Innumerable other compounds have been explored and are being tested for use as liquid fuels. Such unorthodox combinations as nitrous oxide and carbon disulphide, various hydrocarbons such as acetylene, ethylene, benzene, methane, ethane, hexane, dodecane, etc., and even "liquid coal" possess certain characteristics desirable as a rocket fuel. However, the principal lines of development are those discussed above although both the Army and Navy are patiently examining the entire spectrum of chemicals in a concerted effort to develop superior fuels for rocket propulsion.

Safety Foundation Moves Headquarters

The Automotive Safety Foundation will remove its headquarters in Washington, D. C., from 321 Tower Bldg. and 726 Jackson Pl. to 700 Hill Bldg., 839 17th St., N.W., Washington 6, D. C., effective Aug. 19, 1946.



Product planners with springs on their minds will find it helpful to talk things over with Accurate Engineers. For we're planning better products too—better springs, better engineering and better service. These are really more than plans—they have been tested and proved in Accurate's all-out production of fighting springs. Accurate men and machines and methods tre ready now to produce the precision springs you'll want for your better products . . . whenever you are ready.



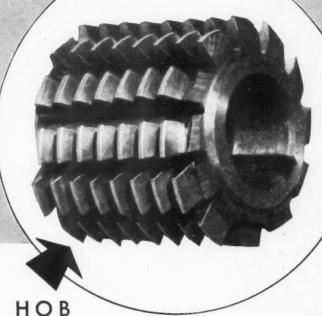
SPRINGS WIREFORMS STAMPINGS

Send for your copy of the new Accurate Spring Handbook. It's full of data and formulae you will find useful. No obligation, of course.

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MANUFACTURING CO. CHICAGO 24, ILLINOIS

BETTER CUTTING TOOLS ARE MADE FROM



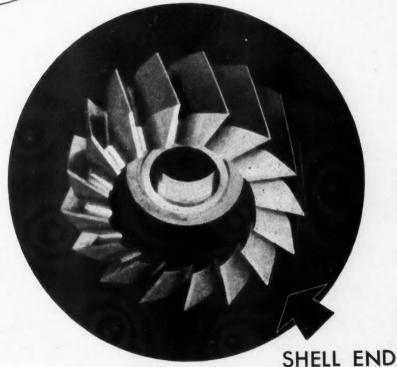
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18-4-1 Type

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This select steel is especially suited for applications where the finished tool must be accurate, efficient, and economical in operation. Write on your company letterhead for literature describing the heat treatment and working of "SUPREMUS," the superior high speed steel.

We invite your requests for additional information or quotations on other grades of JESSOP high speed steel forgings.



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NEW PRODUCTS

(Continued from page 46)

erator, must be mounted permanently on a machine, and the meter mounted on a panel far removed from the generator position.

The generator consists of a small, permanent Alnico magnet rotor mounted on precision sealed ball bearings and capable of continuous operation at any speed within the limit of the meter.

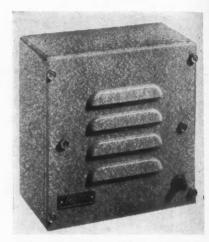
The meter, or indicating instrument, is a rectifier type, including a D'Arsonval movement. It is capable of withstanding a momentary overload up to four times the maximum speed indication without damage.

For installation up to 200 ft the unit may be connected with two conductor No. 18 insulated wire.

The meters are rectangular in shape and available in two sizes: 3 in. and 7 in. Both are available in three scale sizes: 0-1250 rpm, 0-2500 rpm and 0-5000 rpm.

Intercommunication Unit for Shop Use

Dust and moisture proof, steel-cased. industrial-type intercommunication stations have recently been introduced by Executone, Inc., 415 Lexington Ave., New York 17, New York.



Executone heavy duty industrial intercommunication unit

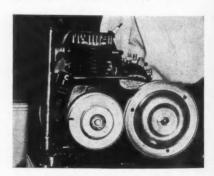
Model C-22 has a call-origination button, and the user can receive and reply to calls from a distance of 20 ft without approaching the station.

Model C-26 has a toggle switch for call origination, assuring freedom from being overheard when the unit is not

The wiring connections are concealed within the cabinet, as that shop conditions cannot cause short-circuits. Designed for mounting on wall or partition, these units are six in. wide, six in. high and three in. deep.

Salsbury Power-Package

The "Power-Package," a six-hp gasoline engine with automatic clutch and automatic transmission, is now in production at Salsbury Motors, Inc., Pomona, Calif., a subsidiary of Northrop Aircraft, Inc., Hawthorne, Calif.

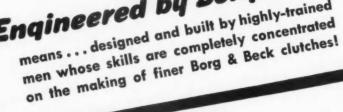


Salsbury Power-Package

The Salsbury Power-Package will power light vehicles, or fit almost any stationary use in which a small engine is required to transmit power gradually and at varying speeds to a driven machine. In the automobile and motor-(Turn to page 82, please)

You can depend on-





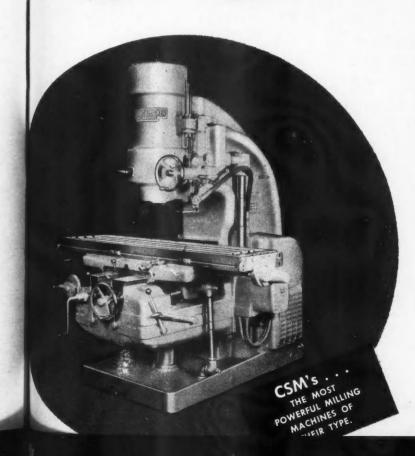


BORG & BECK DIVISION BORG-WARNER CORPORATION CHICAGO, ILLINOIS

MILLING



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4615 Alloy Steel Forging Milled in 3.8 Minutes on New Kearney & Trecker 50 CSM Milling Machine. Former Time 15.7 Minutes

Here is one of those every-day, "run-of-the-mill," small-lot jobs done as fast and as practically as common-sense modern shop methods and equipment say it should be — namely, on a Kearney & Trecker CSM Milling Machine with a carbide cutter used to full efficiency.

CSM Milling Machines were designed to obtain the greatest benefits from modern cutting tools, and are now part of our line of standard models. The design has been developed after a complete analysis of industry's problems of milling with carbide cutters.

Because they are knee type machines, they are readily adaptable to a great variety of work. They are precision built in accordance with long established Kearney & Trecker standards, and will cut metals faster and to finer tolerances and superior finishes than ever before, with high speed steel cutters as well as carbide cutters.

CSM machines are available in 20, 30 or 50 hp models in both plain and vertical knee types.



Write for complete data on CSM machines — CATALOG CSM-20, Please indicate your business connection.

KEARNEY & TRECKER CORPORATION

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This specially prepared Oakite report gives detailed data on cleaning supply tanks, lines, pumps and similar equipment ... outlines 11 sanitation suggestions for plant cleanliness and personnel hygiene. It gives you specific information on these points: 1. What causes coolant solution rancidity. 2. Why durable, non-rancid Oakite Coolants last longer. 3. How Oakite materials and preventive methods combat bacteria growth and reduce possibility of dermatitis infection.

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cycle field, its use is suggested for motor scooters, delivery trucks, parcel delivery trucks, small automobiles, etc.

All three elements of the Power-Package—engine, clutch, transmission—are of Salsbury design and manufacture. The engine weighs 56 lb and develops 6½ hp at 3200 rpm. The clutch, engaged by centrifugal force, applies the power smoothly and eliminates starting shocks. The transmission, in which centrifugal force also serves to change the gear ratio over an infinitely variable range of speeds, is entirely automatic. It "gears down" the engine for moving heavy loads, "speeds up" the ratio to do lighter work faster.

Salsbury clutches, engines and transmissions are available separately or complete in the Power-Package.

Sine Bar Accuracy With New Inclinometer

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill., is offering a precision inclinometer named the Microptic Precision Clinometer, which optically checks angles over a full 360 deg. of arc, to graduations of three minutes of arc. It consists of a light alloy body, containing an accurately divided glass circle and an optical reading system, with a ground and lapped base surface. The manufacturer states that this device can be used in checking angles with accuracy equal to a good sine bar, without any auxiliary tools.

Also included in the line is a gravity operated inclinometer, known as Model C, which does not require surface plates, protractors or other accessory equipment. This instrument was developed to check the pitch of propellors or plane surfaces to an accuracy of one minute of arc.

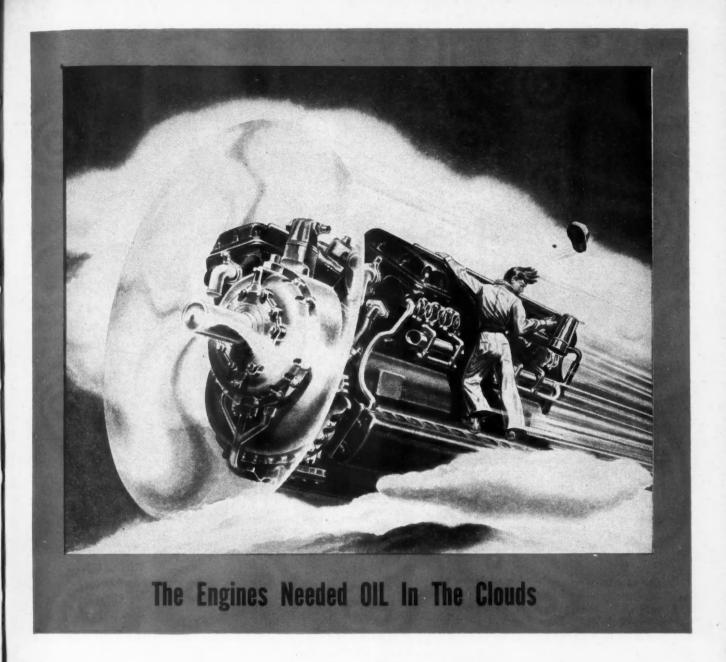
Low Silver Content Brazing Alloys

Two new low temperature silver brazing alloys are announced by Handy (Turn to page 84, please)



Microptic Precision Clinometer





One of the important engines used by the U. S. Army Air Corps developed serious oil-consumption trouble.

The manufacturer called on Pedrick for help. Pedrick engineers flew to the Air Corps rebuilding center. Was the oil ring at fault? They decided it was not. Surprising everyone, they said, "Change the compression ring and you'll solve your problem!"

Ten engines were tested with the new compression ring. Oil consumption was cut to one half—and in some cases to one quarter. After testing 68 additional engines, with similar results, the Air Corps rebuilding center officials considered the problem licked.

This case emphasizes the close relationship of all the rings on a piston and the importance of their functioning together as a team. If you are interested in how small differences in rings can make big differences in engine performance, discuss your problems with Pedrick engineers. WILKENING MANUFACTURING Co., Philadelphia 42, Pa. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto.



and Harman, 82 Fulton St., New York 7, N. Y. The new alloys are called Easy-Flo 45 and Easy-Flo 35. The figures indicate the percentage of silver in the alloys. In addition, they contain copper, zinc and cadmium.

Easy-Flo 45 is distinguished by a narrow melting range running from 1120 F to 1145 F. It is said to offer all the advantages of alloys with a higher silver content in joining ferrous, nonferrous and dissimilar metals.

Easy-Flo 35 has a melting range running from 1115 F to 1295 F and is recommended by the manufacturer for use where high working temperatures are not objectionable.

Heavy-Duty, Industrial-Type Photoelectric Switches

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass., is now manufacturing two series of heavy-duty, industrial-type photoelectric switches. In case of current failure, and when tube replacement is necessary, the series "20" switches act as if the light beam had not been broken, while the series "21" switches, under the same conditions, act as if it had. Each series has two types, one type has the cell built into the control box, the other type has the cell in a separate housing con-



Photoswitch photoelectric control

nected to the control box by five ft of heavy-duty cable.

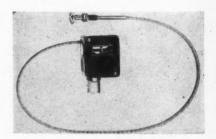
Designed for high-speed operation, the relay operates in one-twentieth of a second with the light source located at any distance up to 20 ft. The housings are impervious to moisture, and it is said that the units are not affected by high temperatures or vibration.

The maker recommends these instruments for such applications as counting, conveyor control, short-range signal systems, motor or valve control, production inspection, machinery safeguards, and other applications in specialized industrial processes.

Remote Control Switch for Machine Tools

A new remote control switch unit, combining an electrical switch and a flexible control to allow for remote operation, has been brought out by Arens Controls, Inc., 2253 S. Halstead St., Chicago 8, Ill

Adaptable to all types of small ma-



Arens remote control switch unit

chine tools, the switch control has a flexible casing and may be mounted at the point most convenient for the machine operator, while the switch box may be located either adjacent to the motor or the plant wiring system.

As the flexible casing is made of steel, it may be run through oil without danger of deterioration. If desired, an oil and waterproof casing may be obtained. The flexible control may be cut to the exact length required. A 10-

(Turn to page 86, please)



WITH THE JOHNSON SELF-LOCKING SCREW

Designed and produced — for all types of internal combustion engines — by "Tappet Specialists," skilled engineers and production craftsmen who have devoted years to the manufacture of the finest tappets made.

Johnson "Lock Tyte" Adjustable Tappets stay put and wear evenly - resulting in longer tappet life - greater valve protection - reduction of false motion - and less frequent engine overhauls.

JOHNSON SELF LOCKING SCREW

Finest steel, heat treated for maximum strength and hardness.

Loads carried sol-idly on full length of firmly seated threads.

No locknut. Lock obtained by live spring action of diaphragm.

No leading edges to cut threads when screw is turned.

WRITE FOR FOLDER 464



HERE COMES THE FLYING BUS

You may see things in the world of the future even more strange than this double helicopter bus that needs no landing wheels. New materials—new production techniques—give promise of untold developments. Important light alloys that will help shape this future world are aluminum and magnesium. The combination of strength with lightness,

together with attractive appearance which both possess in marked degree, will assure many new uses for aluminum and magnesium. But we're not waiting for the world of tomorrow. Bohn engineers would like to discuss possible applications of these light alloys in the products you make. Write, phone or wire for further details.

BOHN ALUMINUM & BRASS CORPORATION

GENERAL OFFICES Designers and Fabricators of LAFAYETTE BUILDING ALUMINUM . MAGNESIUM . BRASS DETROIT 26, MICHIGAN AIRCRAFT TYPE BEARINGS

is is amp switch is contained in the cast aluminum switch box which is constructed to accommodate the standard half-in, conduit.

Perpendicular Dial Test Indicator

A testmaster universal indicator constructed with the dial perpendicular to the axis of the body of the instrument has been put on the market by Federal Products Corp., 1144 Eddy St., Providence, R. I.

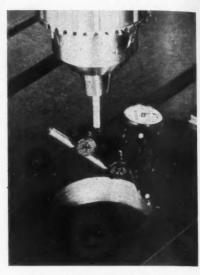
The perpendicular location of the dial makes this new type of test indicator useful for general machine shop,

tool room and inspection. The instrument is adaptable for jig borers, and also for certain drill press and milling applications, where the perpendicular position of the dial aid: in achieving accuracy. Dovetails, friction clamps, and rods provide for the setting of the instrument to check a wide range of hole sizes, with the dial in the horizontal position.

Models 5 and 6 (English) are graduated in 0.001 in. and 0.0001 in. respec-

Models 7 and 8 (Metric) are graduated in 0.0025 mm. and 0.01 mm. respectively.

All models come in a plastic case,



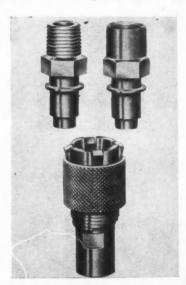
Testmaster universal indicator

complete with dovetail clamp and toolpost holding bar.

Leakproof Hose Coupling

The new Quick Connect air hose coupling being marketed by E. B. Wiggins Oil Tool Co., Inc., 3424 E. Olympic Blvd., Los Angeles 23, Calif., is designed for pressures up to 1,000 psi.

A quick down-pull and push-up on the knurled ring and the coupling is connected with a leakproof seal. Another quick pull on the knurled ring disconnects the coupling. The coupling



The new Wiggins quick connect air hose coupling

body does not have to be disassembled to change gaskets, but remains intact while the gasket is removed and replaced. A simple tool such as a small screwdriver is all that is required for the job.

Besides air, the new coupling will handle oxygen, oil, aromatic fuel and kerosene. The coupling body has ¼-in.

(Turn to page 90, please)



FORMERLY

APPLICATION MOTORS

FRACTIONAL HORSEPOWER



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ES

HERE, MR. BARUCH, is a potent aid for the action you recommend:

INCREASE PRODUCTION

with this get-up-and-go technique







To side-step delays from outside sources, this manufacturer of dump trailers has designed many of his parts for rolled steel. The pawl and box assembly shown is typical ... made as shown in the sketch. Other parts include axles, king-pin base, ratchet wheel,

bearings and sheaves.

The Lincoln Welding Engineer nearby would be glad to help study your problems to discover similar possibilities. Studies in Machine Design free to engineers and designers.

THE LINCOLN ELECTRIC COMPANY . DEPT. 394 . CLEVELAND 1, OHIO

ARC WELDING

female pipe threads and is available with or without a self-sealing valve. A choice of two nipples is provided; one with 1/4-in. male pipe threads, and the other with 1/4-in. female pipe threads. The entire unit is made of aluminum har stock.

U. S. Gauge Offers Line of **Voltmeters and Ammeters**

A new line of d-c moving vane type ammeters and voltmeters with exceptionally long scales has just been announced by the United States Gauge Division of American Machine and Metals, Inc., Sellersville, Pa. Pointer oscillation is said to be reduced to a minimum by the new high-torque, lightweight USG movement.

The extra long, 80-deg. type scale, combined with pointer stability, is said to make these new ammeters ideally suited for automotive, marine, tractor, and Diesel engine panels; also for rate of charge indicators on battery chargers.

Single Button Control

With a visual mechanical signal to indicate whether the motor is "on" or "off," a new a-c across-the-line magnetic starter, with a single push button control, is offered by the Master Elec-



Master a-c across-the-line magnetic starter

tric Co., 120 Davis Ave., Dayton 2, Ohio,

Complete with signal flag, the single button control is available either integral with the starter, or separately as a remote control. Pressed once, the motor starts-pressed again, the motor

The starter provides low voltage and overcurrent protection. It has silver alloy movable contacts on each side of a bridge arranged so the bridge may be removed and turned over to provide new contact surfaces. The silver alloy stationary contacts are mounted on an insulating block.

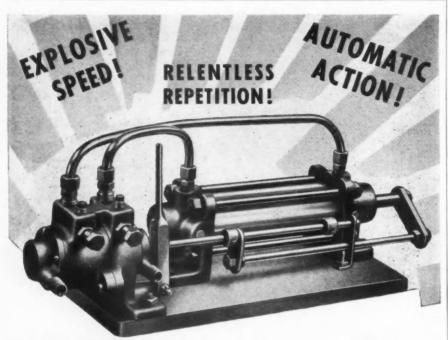
Standard voltage ratings, plus or minus ten per cent of line voltage, are 115 and 230 volts for single phase, and 110, 220, 440, and 550 volts for polyphase motors.

Pressureless Micrometer

Carson Micrometer Corp, 28 Edison Place, Newark 2, N. J., announces production of four re-designed models of its electronic micrometer for thickness (Turn to page 92, please)



Carson electronic micrometer



NOPAK Reciprotrol Valve

Provides All Three — in Full Measure!

This radically new, 4-way, automatic reciprocating valve features Built-in Controls which provide the following advantages in operating any size or make of air or hydraulic cylinder, at 50 to 300 lb. line pressure:-

- Built-In Speed Control regulates stroke-speed in both directions, independently; allows choice of cycle speeds from 0 to 500 per minute . . . depending upon cylinder diameter and length.
- · Accurate Control of Stroke Length from fractional to full.
- Precise Location of Fractional Stroke anywhere within full stroke length.
- Fully-Automatic, Semi-Automatic or Manual operation.

Write, Today, for More Information on the Amazing Reciprotrol.

GALLAND-HENNING MFG. CO., 2774 S. 31st ST., MILWAUKEE 7, WIS.



NOW IN % PIPE SIZE!

The 3/8" pipe size in which Reciprotrol is built makes it suitable for most oscillating applications.

Here Is Our Proposal:

MAKE A TON OF SHEET STEEL GO FARTHER-PRODUCE MORE GOODS

The Trend of American Industry Suggests the Method

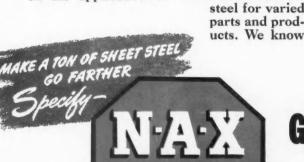
This is not a radical idea. It is in keeping with an established trend in industry to adapt better metals to the job, and make them "pay their own way" through more efficient design and production. Sometimes the goal has been to improve product performance, eliminate excess weight, or simplify fabricating operations. Today, the primary goal of practically all metal-working industries is to get more production-make a ton of steel produce more goods.

High-Tensile Steels Provide the Way

High-tensile, low-alloy steels have the properties needed to attain this objective. By taking advantage of their higher yield and tensile strengths and great corrosion-resistance, designers can reduce sections as much as 25% in a wide range of applications now built of carbon sheet steel-and still retain the same strength and durability. Metallurgy takes the place of mass to boost production per ton of steel.

Our Estimate: One Extra Product for Every Three You Build

We have worked closely with manufacturers on the application of N-A-X HIGH-TENSILE steel for varied parts and prod-



what can be accomplished with this finegrained, low-alloy steel. It is our estimate that production of units per ton can be increased as much as 33% by replacing heavier sections of carbon sheet steel with lighter sections of N-A-X HIGH-TENSILE. And because of the good formability of N-A-X HIGH-TENSILE, exceptional in such a high-strength steel, the change-over can be accomplished without serious problems in fabricating.

Our Challenge: Look at Over-All Costs

We also believe that the higher cost of N-A-X HIGH-TENSILE, compared to carbon sheets can be compensated by production economies, over and above the savings in steel effected by its high strength. Greater corrosion-resistance, freedom from age-hardening and embrittlement, and increased resistance to "set" when bent may reduce handling costs. Exceptional formability and other desirable characteristics of N-A-X HIGH-TENSILE make possible the elimination of intermediate annealing between draws in many cases. Also, finer grain structure and higher hardness produce a smoother surface texture when drawn or stretched, resulting in a saving of metal finishing or in a higher degree of finish when painted or plated. These and other manufacturing advantages of N-A-X HIGH-TENSILE can be utilized to make N-A-X HIGH-TENSILE "pay its own way" on the basis of over-all costs.

We would like to work with you on your problems. We believe N-A-X HIGH-TENSILE will produce one extra product for every three you build.

GREAT LAKES STEEL

Corporation

N-A-X ALLOY DIVISION . DETROIT 18, MICHIGAN UNIT OF NATIONAL STEEL CORPORATION

COPYRIGHT 1946, GREAT LAKES STEEL CORPORATION

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This tremendously powerful rocket engine developed for our Navy by Reaction Motors, Inc. offers new promise of supersonic speeds in the near future . . . of planes that are gone before we hear them coming!

Included in the propellant and pressure control valves of this 210 pound, 8,000 horsepower engine are eight JetFlex bellows assemblies.

Another pioneering MagniLastic development, JetFlex bellows are solving many advanced design problems for lightweight, flexible, high temperature exhaust systems on ram jet, rocket, turbo jet, diesel and reciprocating engines. Vibration dampened, all-atomic welded of Stainless Steel or Inconel, and built for temperatures up to 2,000° F., JetFlex bellows can also be incorporated into

complete tail, valve, or exhaust assemblies to specifications.



Inquiries for further information from interested designers and manufacturers are invited.





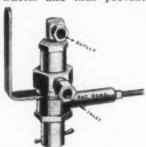
measurements in the shop and the laboratory.

The electronic circuit is unaffected by variations in temperature and line voltage, it does not require leveling and it remains accurate despite vibration or aging of the tubes. At the instant of contact between the micrometer screw and the piece, the circuit lights an indicating lamp. In this way, pressure between the screw and the piece does not occur, and the reading is not affected by this variable. The circuit gives an "on" and "off" indication with 0.000005 in. displacement of the contact.

The micrometer screw's dial is three in. in diameter and has 250 divisions. Each dial division represents 0.0001 in. The instruments are sensitive to .000025 in. over a full one-in. range.

Front Brake Control Valve

Hydraulic Specialties Co., 27 Mechanic St., Buffalo 2, N. Y., has placed on the market a dash controlled hydraulic pressure limiting valve for installation on trucks and other heavy vehicles. It will limit or restrict the amount of breaking pressure at the front wheels and thus prevent their



Hydraulic pressure limiting valve made by Hydraulic Specialties Co.

locking on icy or slippery pavements.

The device features a sliding rubber valve seat that automatically maintains the hydraulic pressure for which it is set and is not affected by expanding brake drums, dirt or small leaks.

Made of bronze, the valve comes equipped with eight ft of flexible control cable and a chrome plated dash adjustment knob.

Mildew-Resistant Hose

Manufactured by Goodyear Tire and Rubber Co., Akron, Ohio, for marketing by the American-La France-Foamite Corp., 8 East La France St., Elmira, N. Y., a water-repellent, mildewresistant fire hose is now available under the trade name "All-Weather."

The hose has two jackets, both of which are treated with a water-repellent and a mildew inhibitor so that all fabric is impregnated.

The edges of the hose are strongly reinforced with cable cord yarns of high tensile strength to withstand the abrasive action of gravel, cinders and rough surfaces.

(Turn to page 94, please)



• When convenience counts and comfort is important you'll appreciate the central location, the friendly hospitality of Hotel Cleveland. In the very heart of Cleveland, adjoining Union Passenger Terminal, garage, and Terminal office buildings. Convenient to stores, theatres, boat docks, Public Hall, Stadium.

Hotel Cleveland, OHIO



PROTECT YOURSELF WITH SYLPHON PACKLESS VALVES

• Fulton Sylphon packless valves, installed on pipe lines carrying oil, gasoline and other hazardous liquids, protect you and your equipment against the danger of leaks . . . even little ones.

Secret of their unvarying efficiency is the dual-ply Sylphon seamless bellows which provides a perfect seal. Made of special composition metal, these bellows replace customary packing and eliminate the disadvantages of packed type valves.

Designed for use aboard ships, in rayon plants, power plants, or wherever steam, air, gases or liquids are handled, these rugged, reliable packless valves have proved their superiority in both industrial and marine service.

Bulletin PB-813, prepared especially for engineers, designers and builders, gives complete information. Send for it today.





FULTON SYLPHON

Temperature Controls · Bellows ··· Bellows Assemblies

THE FULTON SYLPHON COMPANY . KNOXVILLE 4, TENNESSEE

Canadian Representatives, Darling Brothers, Montreal

It is claimed that this flat-cured hose will withstand extremes in temperature yet remain flexible and easy to handle.

Coated Beryllium-Copper **Welding Electrodes**

Buell Air Horns tops in warning signal

slowdowns.

sumption.

Installed as original

equipment on many Trucks and Buses.

They reduce mainte-

nance costs by decreas-

ing stops, starts and

All records prove that

they save tires, brakes,

clutches and gears.

Cut gas and oil con-

efficiency.

A coated beryllium-copper electrode, known as Beryl-Trode, is offered to the welding industry by Ampco Metal, Inc., 1745 So. 38th St., Milwaukee 4, Wis.

The electrode has a medium weight flux coating to aid in stabilizing the arc. It produces a dense deposit which, when heat-treated, develops hardness

BUELL AIR HO

Help Maintain STEAD

and strength values similar to that of the beryllium-copper base metal on which the electrode is designed to be used.

Useful with either the metallic-arc or carbon-arc process, the Beryl-Trode comes in two sizes only, 5/32 in. and 3/16 in. Both are 14 in. long.

Thermocouple Type Plug-in Pyrometer

With a Buell the driver has greater secu-

rity, maintaining a steady cruising speed.

Slowing a 20 ton load from 50 MPH to 30

MPH mecms destroying a lot of energy thru brake lining and tires. It is replaced

by burning more gasoline, increasing load

by burning more gusting, and on engine, and tires again, to regain on engine, and tires again, to regain on engine, and tires again, to regain

speed. This all costs money. We believe a Buell Air Horn is worth \$100.00 yearly

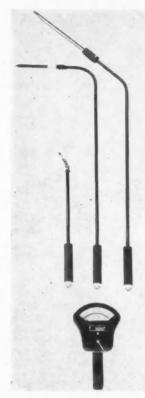
on any heavy highway vehicle. Then remember a Buell will last more than 10

years. How would you rate a \$100.00 in-

vestment that earned \$100.00 yearly for

10 years. Ask the man who has a Buell.

Wheelco Instruments Co., 847 West Harrison St., Chicago 7, Ill., presents a new extension type portable thermocouple pyrometer. The plug-in angle



Wheelco extension type portable pyrometer.

The pyrometer is contained in a sealed, dustproof, aluminum case. A 3-9/16 in. reflector scale reduces parallax errors.

The jeweled, high-resistance movement is resistant to shock, heat, vibration and stray fields. A calibrated Briguet spiral automatically corrects for variations in the cold junction temperature.

Dual iron-constantan scales are calibrated from 0 to 600F or from 0 to 1000F, and dual Chromel-Alumel scales are calibrated from 0 to 1600F or 0 to 2500F. All scales include Centigrade equivalents.

BUELL AIR COMPRESSOR

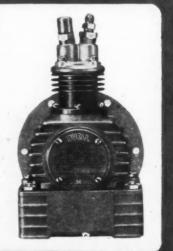
- Used on Passenger Cars, Trucks, Buses, Boats and Planes,
- Small and compact in size . . . efficient and powerful in action.

Buell engine-driven compressors supplied air to operate air brakes in thousands of R.C.A.F. aircraft. Only a combination of quality and precision workmanship could meet the requirements of this type of service.

Designed for compactness and light weight, they are far more efficient and powerful than their size indicates. Let us prove their adaptability to your

BUELL MANUFACTURING CO.

2975 Cottage Grove Ave., Chicago 16, Ill.



extensions are available in either straight, 45 deg, or 90 deg angle types.

BOOKS

ELECTRONICS IN INDUSTRY George M. Chute. Pub. McGraw-Hill, pages. Here is a text on the application and operation of electronic equipment in-tended for men in industry, for users and operation of electronic equipment intended for men in industry, for users rather than designers and manufacturers of such products. The author is the application engineer, General Electric Co., in Detroit, and his book stems from notes on an evening course on the subject in connection with the University of Michigan Extension Service. Designed for the man in industry with little technical training, it explains vacuum tubes, traces circuits in terms of electron flow, and employs the new standardized system of symbols. This, the first edition contains 28 chapters and the first edition, contains 28 chapters and is profusely illustrated. A sampling of chapter headings is as follows: Light and Heat Relays, Choosing Electronics, Control of Electron Flow in a Tube, Heating and Light Dimming Controls, Voltage and Speed Regulation, Non-Electronic Devices.





C L E A R I N G H Y D R A U L I C P R E S S E S

for die-sinking coining embossing

plus automatic feeds . . . automatic stroke cycle sequence

Clearing combines precision with speed to give you presses for volume production in coining, embossing, and die-sinking operations. Clearing Hydraulic Presses of the type shown here can be built in any capacity required. Rigidity in Clearing four-column press design is ample to meet the most exacting specifications in accuracy.

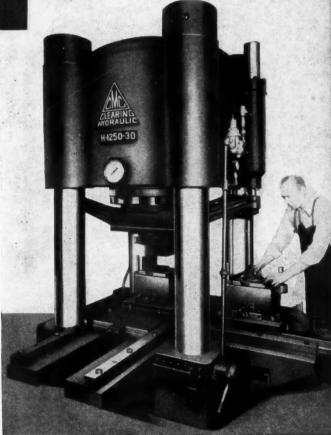
The 2000-ton press above is built with two feeding die tables, that move alternately into working positions beneath the slide. Table and slide controls are interlocked for automatic table feed. Sequence of the stroke cycle is automatically controlled to give three different speeds at two different pressures.

The presses illustrated are good examples of the advantages provided by Clearing press design. Whatever your press requirements may be, let a Clearing Sales Engineer give you complete information.

CLEARING MACHINE CORPORATION
6499 West 65th Street Chicago 38, Illinois

OFFICES...CHICAGO . NEW YORK . CINCINNATI

VELAND . DETROIT



1250-ton Clearing Hydraulic Press used in the manufacture of heating elements for electric ranges. Note position of die tables . . . one in working position beneath slide, the second in position for unloading and loading.

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Profit Sharing vs. Production Incentives

(Continued from page 15)

same earning power for the same degree of effort, there is a natural tendency to resist all downward adjustments and this frequently results in attempts to minimize the real value of the change.

A production incentive where the earning opportunities are proportional to true labor utilization encourages the worker to use his time to best advantage continuously, because he receives proportional compensation. If he can run two machines instead of one, his

incentive opportunities double. But even then there will be cases where the change may temporarily result in a lesser degree of effort required and therefore in less incentive opportunities.

Some additional inducement or incentive should be provided for all those who are affected directly or indirectly by a change. This added inducement should be in proportion to the importance of that change, and it should be

applied simultaneously. It could take the form of cash awards made in proportion to the labor saved and could be paid, or at least posted, as the change is made. In this manner there would be a strong inducement to support all new ideas conducive to labor saving and to give them maximum recognition. This would also strengthen direct production incentives by counteracting the possibility of negative influences as far as changes are concerned.

Whether only the workers directly engaged in the operation, or all workers in the plant or department, participate in such benefits and whether supervision also participates, are questions of company policy, size and circumstances. The important things to remember in

all cases are:

 (a) The reward should be calculated and stated simultaneously with the change;

(b) It should be closely related to labor saving;

(c) It should be substantial enough to make it really worth while;

(d) If there is a production incentive plan, all production standards or piece rates should be adjusted immediately after the change takes place.

In this manner the question of more direct "sharing" of benefits would be answered without the risks and limitations of the usual profit sharing plans.

Such an incentive would also create a positive influence which, insofar as technological advances are concerned, could neutralize the negative influences of job insecurity previously described. In association with other legitimate job security provisions and a good suggestion plan, it would create and maintain an atmosphere eminently favorable to the promotion of new ideas and to their ready acceptance. In conjunction with a good production incentive plan-such as one based upon a dependable and realistic measure of labor utilizationit would also increase the effectiveness of the production incentive and greatly facilitate its proper administration .-From an address before the Production Conference of the American Management Association.



The slip-on-the-transmission-shaft feature of this MECHANICS Roller Bearing UNIVERSAL JOINT eliminates the need for the convential splined stub shaft, thus reducing cost and weight. Let our engineers show you how this and other MECHANICS features will help give your product competitive advantages.



MECHANICS UNIVERSAL JOINT DIVISION

Borg-Warner 2020 Harrison Avenue, Rockford, III. Detroit Office, 7-234 G. M. Bldg.

Pneumatic Tester

(Continued from page 27)

tester is providing preliminary data which indicate that by using a recording frequency meter, the chart will show what appears to be a point of incipient failure. This data, of course, is extremely valuable to the designer and engineer. Brittle materials show this point of incipient failure to be very close to that of complete fracture, but in ductile materials it appears long before visible fracture becomes apparent.

"PERFECT"
OIL SEALS

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HAVE BEEN USED SUCCESSFULLY

BY ENGINEERS AND MANUFACTURERS

TO RETAIN LUBRICANT

AND EXCLUDE FOREIGN MATTER

FOR THE LAST

18 Years

of Their Value
to Industry



CHICAGO RAWHIDE MANUFACTURING COMPANY

PHILADELPHIA . CLEVELAND . NEW YORK . DETROIT . BOSTON . MITSBURGH . CINCINNATI 67 YEARS MANUFACTURING QUALITY MECHANICAL LEATHER GOODS EXCLUSIVELY AND NOW SIRVENE SYNTHETIC PRODUCTS

A Canard Type Light Personal Airplane

(Continued from page 35)

air for submerged engine cooling and flight control purposes was one of the major design problems. External scoops are of course the simplest means for obtaining a large air quantity at suitable pressures, however, a scoop takes in air which is virtually stationary in space and the energy required to ac-

The method for obtaining sufficient celerate this air to the speed of flight requires considerable power. In the MO-1 a multitude of slots are provided completely around the fuselage in the aft portion, and the boundary layer is drawn in through these slots. This system has two advantages: (1) The air which is taken in is air which has traveled a considerable distance along

the fuselage skin and has been accelerated by surface friction to a speed nearly that of flight. This air, so to speak, is already "on board" and requires no additional energy to accelerate it to the speed of flight. (2) By drawing off the boundary layer around the complete fuselage a smaller fineness ratio may be used without separation and the consequent drag reduction can be captured. A pressure slot is provided all the way around the fuselage a short distance ahead of the propeller spinner to add inertia to the boundary layer and stabilize the flow conditions into the propeller blades. This pressure slot also functions to aid re-establishment of the increasing pressure gradient and minimizes the adverse effect which a pusher propeller has on fuselage drag. Pusher propellers are noted for their poor efficiency due to the disturbed flow conditions caused by the fuselage in the up-stream flow. It is anticipated that the use of both suction and pressure slots in the aft portion of the fuselage will so stabilize the flow around the fuselage as to produce conditions compatable with normal propeller efficiency. A laminar-flow wing section is used having exceptionally low drag coefficients in the range of Reynolds numbers corresponding to the high speed condition.

The major weight items such as main landing gear and engine are attached to a single bulkhead. The main forces applied come from the front spar and main landing gear. fuselage bulkheads are used to separate the high and the low air pressure chambers and to conduct air to the wings and front stabilizer. The fuselage skin and floor form a duct leading air to the stabilizer. No engine mount in the usual sense is required since the engine is mounted from the cylinder heads on corner brackets joining the fuselage skin and main bulkhead.

The blower furnishes cooling air for the engine, high lift coefficients for the wing, creates conditions favorable to a two-control design, makes possible increasing lateral control with decreasing speed, operates the flaps, controls airflow conditions ahead of the propeller and compensates for the nose-down moment of the flap and eliminates the

The MO-1 was designed so that it might be readily towed behind a car and stored in a one-car garage. Even though this method is not used, it will necessitate considerably less hangar space than a conventional airplane. The wings may be easily removed and no control cables need be disconnected or re-adjusted. Each wing seals against the fuselage when installed. The stabilizer span, 6.5 ft, is well within the 8 ft width limit allowed on highways. By using a pusher propeller and a Canard design, the nose wheel can be carried farther forward, thus allowing an increase in wheel base with an attending improvement in ground handling characteristics.



THESE inexpensive one-piece, self-locking Palnuts perform the same function as regular nut, lockwasher and plain washer combined. You not only replace three parts with a single Palnut, but power drivers may be used to further speed up assembly. Special sockets for power drivers pick up, spin on and tightened, Palnuts stay tight under vi-

Handle ONE part

tighten Palnuts in one operation. Once bration - assured by their exclusive double locking spring action.

instead of THREE

Send for samples. Ask for engineering literature on entire Palnut fastening line.

THE PALNUT COMPANY

60 Cordier St. Irvington 11, N. J.





the best brake is 18 18 1

Do you know why bus and truck lines overwhelmingly choose Air Brakes—Bendix-Westinghouse Air Brakes? It will pay you well to find out. Here is a capsule summary—1. Bendix-Westinghouse Air Brakes are the safest brakes money can buy. 2. Bendix-Westinghouse Air Brakes make driving easier, cut driver fatigue, make better, safer schedules. 3. Bendix-Westinghouse Air Brakes cost less in the long run, pay for themselves in lowered service costs.

4. Bendix-Westinghouse Air Brakes are long-lived, often outlasting the life of the vehicle.

Get the facts on Air Brakes—Bendix-Westinghouse Air Brakes! Your distributor can show you how easy and economical it is to modernize your present equipment with them, or will help you select, for new equipment, the right Air Brake for the specific job.

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY

Bending-Westingkosse

WORLD STANDARD OF SAFETY



PROPER MATERIAL HANDLING
is a precision problem that assumes a
new importance as production costs
rise. Executives now convert unskilled
labor to more profitable work by use
of CLARK industrial haulage vehicles
to carry, lift and tier materials.

Handling costs reach new "lows" as CLARK fork trucks and tractors move loads between docks, warehouses and production lines.

Let a CLARK engineer help you work out a plan to speed movement and reduce costs—no obligation.

CLARK
FORK TRUCKS LIFT
DUMP TRACTORS TOWING
Gas and Battery Powered

CLARK TRUCTRACTOR

CLARK EQUIPMENT COMPANY

Division of CLARK EQUIPMENT COMPANY

BATTLE CREEK, MICHIGAN

OTHER PLANTS - BUCHANAN, JACKSON, BERRIEN SPRINGS, MICHIGAN

OTHER PLANTS - BUCHANAN, JACKSON, BERRIEN SPRINGS, MICHIGAN

Products of CLARK • TRANSMISSIONS • ELECTRIC STEEL CASTINGS AXLES FOR TRUCKS AND BUSES • AXLE HOUSINGS • BLIND RIVETS INDUSTRIAL TRUCKS AND TRACTORS • HIGH-SPEED DRILLS AND REAMERS METAL SPOKE WHEELS • GEARS AND FORGINGS • RAILWAY TRUCKS

Stresscoat Analysis

(Continued from page 39)

in connection with the cambox, Fig. 4, developed a network of stress concentrations on the various ribs, indicating foci of incipient failure. Based upon previous experience, the crankcase was redesigned as shown in Fig. 8, eliminating all stiffening ribs and redistributing metal where it would be most effective. This resulted in a thin diaphragm section, cored from the rear with generous fillets blending around the diaphragms and bosses.

As in the case of the cambox the refinement in design to make the part do its job did not result immediately in weight reduction. However, in this particular case it was possible to use magnesium instead of aluminum after the level of stress had been reduced. As a result, the new crankcase is 27

per cent lighter.

In the light of the foregoing it is apparent that Stresscoat analysis is used by Continental primarily as a rapid means of predicting failure in service and as an indicator of the location and direction of stress concentration. According to William T. Bean, Continental's expert on stress analysis, Stresscoat indications are used principally for qualitative design analysis. Once the location of stress concentrations has been established, the actual loading is calculated from the strain gage and extensometer readings taken under actual flight conditions.

Judging by a great deal of practical experience, it is safe to generalize that stress analysis of this character, if properly interpreted, will always produce an improved structure, free from stress concentration, and with a marked increase in endurance strength due to uniform stress distribution. In most cases redesign will result in some weight saving, even though minor, but will surely mark the difference between a part that must fail and one that will stand up. On the other hand, Continental has a record of many cases of important weight savings, often as high as 35 per cent.

While Stresscoat analysis has been found invaluable at Continental in the development of high performance, low weight aircraft engines, it is believed that the method holds interesting possibilities for designers of automotive products. In mass production, weight reduction is cost reduction. In the current trend to light-weight motor cars and, particularly, in the future development of high-output, light-weight passenger car engines, there also is strong promise of providing a means for designing parts of small size and weight and yet endowed with maximum The Stresscoat physical properties. design procedure is not expensive compared with "cut-and-try" methods and may prove to have great potential economy.



These are metal powder parts by Moraine.

They are typical of many parts made by powder metallurgy for a variety of applications—and for varied reasons. Some require the oil-retaining, self-lubricating quality which cannot be duplicated by orthodox materials. Others take advantage of the elimination of costly and complex secondary machining operations. Still others utilize the fine finish and close sectional tolerances attainable in this new field of fabrication.

But whatever the application and whatever the advantage, these metal powder parts have one thing in common: All are produced in volume, for volume is the key to the practicability and economy of powder metallurgy at Moraine. The nature of tooling and methods makes large, continuous runs essential to satisfactory pricing and delivery.

If your production involves a large need for small parts, fabricated to practical tolerances with a fine finish, consult Moraine Products. Metal powder parts by Moraine may prove to be the answer to lower costs, improved quality.



METAL POWDER PARTS
BY MORAINE



MORAINE PRODUCTS DIVISION OF GENERAL MOTORS

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Rise and Decline of the American Steam Car Industry

(Continued from page 33)

pressure on one side and to the pressure of a spring on the opposite side. Normally the spring pressure predominated, and the valve was open, allowing fuel to flow to the burner. When the boiler pressure reached the value for which the regulator was set, the steam pressure on the diaphragm overcame the spring pressure and the fuel valve closed. With the fire reduced to a minimum, the boiler pressure would soon drop, the spring would overcome the

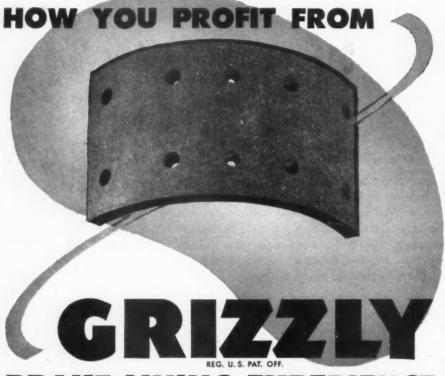
steam pressure on the diaphragm, and the fire would be turned on full blast again.

Owing to the instant commercial success of the Locomobile, many other light steam carriages of the same general design appeared on the market in quick succession. Some of them were what might be described as Chinese copies of the original, while in others creditable attempts had been made to eliminate some of the known weak-

nesses of the prototype. At the first automobile show held in America, in Madison Square Garden, New York, in November, 1900, steam cars were exhibited by no less than nine concerns. A feature of this exhibition was a ramp with gradually increasing grade, built on the roof of the Garden, on which exhibitors could demonstrate the hillclimbing abilities of their cars. Needless to say, the steam-car contingent took full advantage of this opportunity. In 1901 the number of steamer-exhibitors at the New York show rose to 14. but this marked the climax, for at the next show, held early in 1903, there were only six exhibitors left in the steam class.

Among the advantages of the light steam car were its silence of operation. the great flexibility of its powerplant, which enabled it to proceed at a mere crawl in traffic and to ascend hills at considerable speed, and its light weight and low cost. The first Stanley car weighed only about 400 lb, but each succeeding model was somewhat heavier, The car had a wheelbase of about 56 in, and a tread of 50 in., and was equipped with 28-in. bicycle wheels. The original price of the Locomobile was \$600, but later the car sold at \$750. As may be readily imagined, the car had many imperfections, most of them the result of the extremely light construction. What some of these faults were was to be read between the lines of the announcement of a new model, issued during the summer of 1900, when one-thousand of the earlier cars were said to be in use.

There was, first, an increase of 50 per cent in the water capacity, and a somewhat smaller increase in the fuel capacity. The necessity of replenishing the water supply every 20 miles or so had been found quite a handicap. Both the air tank and the fuel tank were made of heavier stock, as it had been found difficult to keep the origina! tanks air-tight. The original body was rather cramped, and in the new model both the seat and the wheel gauge were A side steering lever was widened. substituted for the tiller. An auxiliary throttle was provided, which enabled the driver, when leaving the vehicle, to shut off the steam from the engine by means of a valve in a comparatively inaccessible position, so the car could not be started accidentally by meddlers. The safety valve was so arranged that it would blow off into the water tank. This did away with the noise of the sudden blow-off, which would generally occur when the car was left at the road side, and was the cause of frequent horse runaways. An auxiliary hand feed pump was provided, as it had been found that the regular pump often failed to keep the water in the boiler at the proper level.



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Grizzly has produced fine quality brake lining for over 30 years, and the experience gained through these years pays rich dividends to Grizzly users.

Experience, in both automotive and industrial fields, has enabled Grizzly to solve brake lining problems of widely divergent natures. Grizzly experience

has been of utmost value in Grizzly research and study of new brake lining developments, and this same experience has helped establish Grizzly as one of the largest, most dependable producers of molded brake lining.

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OIL RESISTANCE

is only one of Hycar synthetic rubber's unusual and valuable properties. Others are listed in the box at the right.

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But most important, these properties may be had in an almost limitless number of combinations, each designed to meet specific service conditions of the finished Hycar part.

Our files contain more than 5000 recipes for Hycar compounds—each compound engineered to do a certain job. Parts made from HY-

CAR have seen service in every industry, giving long life, dependability, and economical operation.

That's why we say, ask your supplier for parts made from Hycar. Test them in your own application, difficult or routine. You'll learn for yourself that it's wise to use HYCAR for long-time, dependable performance. For more information, please write Department HH-8, B.F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

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- EXTREME OIL RESISTANCE insuring dimensional stability of parts.
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- 3. ABRASION RESISTANCE—50% greater than natural rubber.
- 4. MINIMUM COLD FLOW—even at elevated
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- LIGHT WEIGHT 15% to 25% lighter than many other synthetic rubbers.
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- NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)

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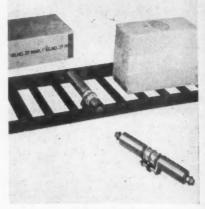
New Production Equipment

(Continued from page 42)

with a control circuit which may be standard controllers for additional feaeither separate or common with the power circuit. The solenoid air valve may be energized from either the power or control supply sources by simple reconnection. Standard controllers have tapped primary control transformers which can be connected for operation at 110, 220 or 440 volts, 60 cycles; or for 380 volts, 50 cycles. Other voltages and frequencies are available on special order. Space and terminals are provided within the

tures such as 24-volt initiating switch control, two-stage pilot switch control, or 24-volt two-stage pilot switch con-

L ATEST addition to the Rolacoder line of Adolph Gottscho, Inc., 1 Hudson St., New York 13, N. Y., is the "Rolacoder 50," a marking attachment for placing continuous impressions on the bottoms of cases or crates as they travel along a roller conveyor.



Rolacoder 50

The manufacturer supplies a complete self-inking assembly containing all parts necessary to imprint products automatically. This assembly is installed in a roller conveyor in place of one of the standard rollers. The type cylinder carries a channel or slot into which the interchangeable rubber type is inserted. Inking is by two solid felt ink rollers in contact with the type.

The Rolacoder 50 will imprint a code or mark repeating approximately every 6 in. Thus, one full imprint, at least, appears on cases as short as 6 in. However, for cases of length less than 6 in., the information may be inserted twice in the die wheel. Type sizes may be % in. or % in. Inks are quick-drying permanent type.

Rolls are 2 in. in diameter. For those roller conveyors which require smaller diameters, the unit is mounted below the center line of the rest of rollers so that the top surfaces are in

OVEJOY TOOL CO., 134 Main St., Lovejoy Tool co., 100 Springfield, Vt., has brought out a new face mill called the "Cutsall." It is a tool-bit-type mill with Carboloy cemented carbide blades, and embodies several unique design features. The

(Turn to page 106, please)



LIGHT PEDAL PRESSURE

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VIBRATION DAMPENING

ACCURATE BALANCE

DIRT EXCLUSION

HEAT DISSIPATION

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* ROCKFORD Spring Loaded CLUTCHES are adjusted at the factory, to extreme accuracy, so that no further adjustment will be required during the life of the clutch facing. Any take-up that may become necessary is made at the pedal. This permanent adjustment feature saves servicing, promotes smooth engagement, and prevents grabbing and chattering.

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Shows typical installations of ROCKFORD

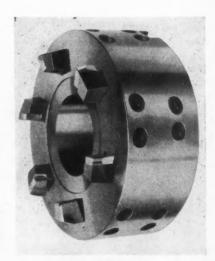


CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes

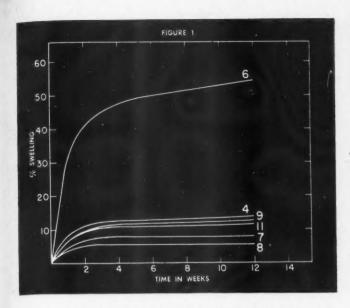
capacity tables, dimensions and complete specifications.

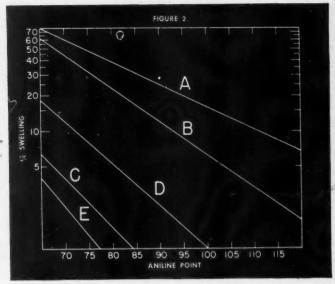


315 Catherine Street, Rockford, Illinois, U.S.A.



Cutsall face mill





SWELLING OF BLACK-LOADED NEOPRENE IN OILS OF VARIOUS ANILINE POINTS.

Oil No.			Point °C.
6		 	77.7
9	SAE 30 mo.or	 	107.0
4	SAE 30 motor	 	109.0

ANILINE POINT OF OIL VS. LOGARITHM OF PER CENT SWELLING

A	Black-loaded Neoprene
B	.Cork-loaded Neoprene
C	Black-loaded Buna N
D	Cork-loaded Buna N
E	Cork-loaded Thioko

SEALING OILS WITH SYNTHETIC RUBBER

Aniline point as an index of volume change

The aniline point of an oil, the temperature at which dissolved aniline will separate or cloud when an oil and aniline mixture is cooled, is a firm index of the volume change which that oil will cause in a given synthetic rubber compound. Synthetic rubber gaskets or parts chosen without reference to this point may fail in service.

The relation between aniline point and volume change is shown in Figure 1. Here the same Neoprene compound is immersed in six different oils. Although all are rated SAE 30, each has a different aniline point. Since the aniline points of five of these oils fall within a comparatively narrow range, the degree of swelling they produce is similarly restricted. Oil No. 6, however, although rated SAE 30 like the others, has a low aniline point, indicating high solvent power. Consequently No. 6 attacks with violence and causes a considerably greater volume increase.

To protect against such erratic volume changes in a synthetic rubber material, include aniline point in your oil specification. Remember, however, that aniline point is a measure only of an oil's solvent effect, and not of its value. Thus oil No. 6, Figure 1, may be a better lubricant than the less virulent No. 8.

Figure 2 shows the behavior of several synthetic rubber and synthetic-rubber-and-cork compositions when immersed in one oil. These synthetic rubber compounds will maintain comparable behavior patterns when immersed in other oils. However, a negative change, shrinkage, may occur, depending upon the base polymer used or the oil encountered.

Three papers covering Armstrong's research on aniline point have appeared in IND. ENG. CHEM. (August 1940, May 1942, January 1945). If you would like reprints for your files, write us.

An Armstrong Gasket Engineer will be glad to help you analyze your gasketing problems and suggest materials suitable for the oils involved. Call him or, if you prefer, send drawings and details to us.



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tion of "Gaskets, Packings, and Seals," twelve pages of helpful information. Address Armstrong Cork Company, Gaskets and Packings Department, 1508 Arch Street, Lancaster, Pennsylvania.

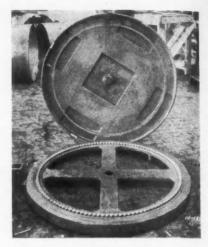


nousing is built to take either left- or right-hand blades. It holds the blade face slightly back of center so that positive and negative radial rake can be obtained from the same blades. There are two set screws for each blade, one of which bears on the tapered base of the blade and provides for fine blade adjustment—the other is to lock the blade securely in the housing.

The Cutsall is available in 6-in., 8-in., 10-in. and 12-in. diameter sizes. One size of Carboloy tipped blade fits all four cutter sizes. Blades are tipped with either of two grades of Carboloy

nousing is built to take either left- or cemented carbide—one for cutting steel right-hand blades. It holds the blade or one for cutting cast iron and non-face slightly back of center so that ferrous metals.

WHITING CORP., 157th and Lathrop St., Harvey, Ill., has recently introduced a rugged, simple turntable. The top, which is plain, grooved, raised track or checkered to meet requirements, is carried on 1-in. diameter hardened steel, lapped balls, running in a specially machined ball race to permit wide distribution of load and easy operation. A quick-acting, foot-operated release lock, at turntable top level, holds the table securely in position. The

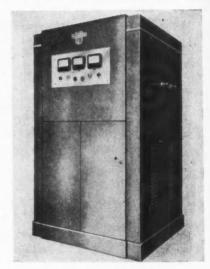


The Whiting ball-bearing turntable

top overlaps the bottom casting to prevent accumulation of dirt. Standard sizes range from 42-in. to 96-in. diameter. Larger tables will be built on order.

MODEL "1400" is the newest in the line of high-frequency induction heating units manufactured by the Induction Heating Corp., 389 Lafayette St., New York 3, N. Y.

A filament voltage stabilizer, variable output control, circuit breaker for overload protection, water-pressure gage, time delay water system and supervisory pilot lights are incorporated in this new generator. When fully loaded, this unit is capable of an output of 1400 Btu per min or approximately 25 kw at a nominal frequency of 375



Ther-Monic high-frequency induction heater

kc. It has a full-load input of 50 kva at 90 per cent power factor and operates on a 205-245 volt, 60-cycle, three-phase power supply. Provision is made to handle higher line voltages through installation of a transformer between the line and the generator.

The unit has two water-cooled oscillator tubes and six rectifier tubes.
(Turn to page 108, please)





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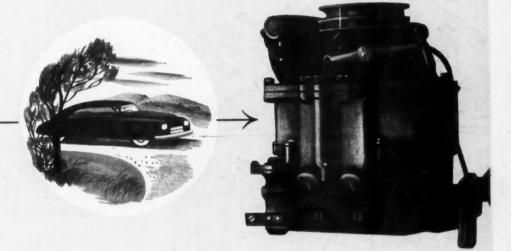
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These tubes are protected by a device which automatically keeps water flowing through the water jackets of the tubes after the power is shut off.

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Indian Company to Build and Sell Chrysler Products

Plans for the manufacture of Chrysler Corporation cars and trucks in India by Premier Automobiles, Ltd., started several years ago and interrupted by the war, now are nearing completion. V. M. Meswani, general manager of Premier, has left Detroit, where he spent four months studying production methods, for India to take charge of operations. He said that assembly units will be ready for operation by Oct. 1, and that parts plants will be ready to go by the first of next year. The company is backed by a large group of Indian industrialists. During the war it gained manufacturing experience through its activities in building ships and planes. The arrangement to build Chrysler automotive vehicles is seen as part of the trend of the nationalistic government to get away from sole dependence on England for manufactured goods. The cars will be distributed in India, Burma, Ceylon, and Goa. Although some parts will be procured from Chrysler plants in this country at the outset, the ultimate goal is to produce all component parts in India as soon as possible.



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